F-35A Training Basing

Environmental Impact Statement

Final

Volume I

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14. ABSTRACT
This EIS was prepared by the Air Force in accordance with the National Environmental Policy Act of 1969 (42 United States Code [U.S.C.] 4321 et seq.), as implemented by the Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] 1500?1508), and Air Force Instruction (AFI) 32-7061, The Environmental Impact Analysis Process (as promulgated in 32 CFR 989). This EIS assessed the environmental consequences of the alternatives on the following resource categories: airspace management and use, noise, air quality, safety, soils and water, vegetation and wildlife, wetlands and aquatic communities, threatened and endangered species, cultural resources land use and recreation, socioeconomics, environmental justice, infrastructure, transportation, and hazardous materials and waste. Analysis established that no substantial adverse impacts on the following resource categories would result from implementing any of the alternatives or associated aircraft scenarios: airspace management and use, air quality (except for the Boise AGS 72-aircraft scenario), soils and water, vegetation and wildlife, wetlands and aquatic communities, land use and recreation, transportation, or hazardous materials and waste. Training overflights may affect, but are not likely to adversely affect, threatened and endangered species. At Boise AGS, Luke AFB, and Tucson AGS, noise levels generated by the F-35A in the vicinity of the main airfields would adversely impact the exposed population, subsequently resulting in potentially adverse impacts on residents, property values, and environmental justice communities, including children. Noise generated at the Roswell International Air Center, El Paso International Airport, and Biggs Army Airfield auxiliary airfields would generate adverse impacts under the Holloman AFB alternative. Low-level training overflights in some locations could result in increased annoyance for persons under the training airspace. Personnel changes at Holloman AFB would create potential adverse impacts on infrastructure, particularly water, and housing. Construction expenditures and personnel changes would generate beneficial socioeconomic impacts on the surrounding communities by generating additional jobs and income.

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RECORD OF DECISION FOR THE F35A TRAINING BASING

Introduction

The United States Air Force (Air Force) is issuing this Record of Decision (ROD) for the F35A Training Basing Environmental Impact Statement. In making this decision, the information, analyses, and public comments contained in the F35A Training Basing Final Environmental Impact Statement (FEIS) were considered, along with other relevant matters. The Air Force is the Lead Agency. The Federal Aviation Administration (FAA) and the United States Navy, United States Marine Corps (USMC) are Cooperating Agencies.

This ROD is prepared in accordance with the Council on Environmental Quality regulations implementing the National Environmental Policy Act (NEPA) at Title 40 Code of Federal Regulations § 1505.2, record of decision in cases requiring environmental impact statements). Specifically, this ROD:

States the Air Force's decision (page 1);

Identifies alternatives considered by the Air Force in reaching the decision and specifies the alternative considered to be environmentally preferable (page 2);

Identifies and discusses relevant factors that were considered in making the decision among the alternatives and states how those factors entered into its decision (page 3); and

States whether all practicable means to avoid or minimize environmental harm from the selected alternative have been adopted, and if not, why they were not adopted, and summarizes the applicable monitoring and enforcement program adopted for the applicable mitigation (see pages 4 through 10).

Decision

The Air Force selects Luke Air Force Base as the Air Force's first F-35A Pilot Training Center (PTC) and will, by this decision, bed down seventy-two F35A primary aircraft authorized (PAA) training aircraft at Luke Air Force Base. This beddown of the seventy-two F-35A PAA is divided into three (3) training squadrons of twenty-four F-35A PAA and supporting personnel and facilities. The Air Force will, by this decision, achieve a total of five non-Foreign Military Sales training squadrons (120 PAA) at Luke Air Force Base consisting of F-16 aircraft and at least three squadrons of F-35A aircraft. For Luke AFB, the FEIS documents analysis to support decisions up to a total of six F-35A training squadrons (144 Primary Aircraft Authorizations (PAA) total) plus the two existing Foreign Military Sales F-16 squadrons (26 PAA total). Within this analyzed construct, the Air Force will not be required to conduct a Supplemental EIS (SEIS) at Luke AFB for future basing decisions as long as two conditions are met:

- The total combination of training F-35A and Air Force F-16 aircraft does not exceed 144PAA, and
- There are no future developments covered by 40 CFR Section 1502.9(c).

The Air Force anticipates making another basing decision for up to an additional three training squadrons (72 PAA) of F-35A aircraft on or about December, 2014.

Background

The Air Force designated the F-35A Lightning II to replace and supplement existing F-16, A-10, and other legacy aircraft fleets and to complement the F-22. F-35A aircraft will fulfill a wide range of roles and missions.

An important part of any military weapons system is sustaining a required number of trained personnel at a required level of expertise. The training organizations play an important role in producing and sustaining the required number of qualified personnel to operate and support the weapons system. Based upon the Air Force's planned purchase of up to 1,763 F-35A aircraft (the only version the Air Force is acquiring), 11 F-35A training squadrons, each with 24 aircraft, is the estimated requirement to sustain Air Force pilot training production. In addition, the Air Force is committed to international partners training at the Air Force's first F-35A pilot training center. Likewise, the Air Force plans to support U.S. Department of Defense agreements for potential Foreign Military Sales (FMS) supported countries. This ROD focuses on the location for the Air Force's first F-35A PTC and the initial number of squadrons to be based at that PTC location. Likewise, the Air Force will leverage Luke AFB's extensive capacity to the maximum extent possible. The next F-35A training basing decision will leverage existing capacity and expedite decision-making through reliance on the FEIS as appropriate. The Air Force anticipates making another basing decision for up to an additional three training squadrons (72 PAA) of F-35A aircraft on or about December, 2014. Further training squadron basing decisions will be analyzed in subsequent NEPA documents, as required.

Alternative Identification

On August 31, 2009, the Deputy Assistant Secretary of the Air Force for Installations tasked a group of senior action-level representatives from the Air Force Secretariat, Air Staff, and selected Major Commands to draft criteria to enable identification of potential candidate bases.[1] Basing criteria were applied to possible locations to identify candidate training F-35A basing locations for the F-35A Training EIS, and were approved by the Secretary and Chief of Staff of the Air Force. The four bases which met the identified objective and operational criteria and are considered reasonable alternatives consist of:

Boise Air Terminal Airport Air Guard Station (Boise AGS), Idaho;

Holloman Air Force Base (Holloman AFB), New Mexico;

Luke Air Force Base (Luke AFB), Arizona; and

Tucson International Airport Air Guard Station (Tucson AGS), Arizona.

Eglin Air Force Base, Florida, was identified as a candidate base but eliminated from detailed consideration due to airspace congestion.

The No Action Alternative constitutes the baseline conditions at each alternative location and other constraints (see FEIS, § 2.3.5). A total of twenty-three different basing scenarios were evaluated in

[1] Detailed discussions at FEIS, page 1-3, §1.4.1, and page 2-3, §2.2.2.

the FEIS. In addition, the No Action Alternative was evaluated for each of the alternative basing locations.

Environmentally Preferred Alternative

The environmentally preferred alternative is considered to be the No Action Alternative. The No Action alternative constitutes the baseline conditions at each alternative location and would not substantially change existing environmental impacts.

Basis of Decision

Multiple statutory mission, national security policy, operational, environmental, economic, and technical factors were considered in making this decision. A comparison of the environmental impacts appears at Section 2.7 of the FEIS. Other specific factors included weather, airspace, capacity (facilities, runway, ramp), and costs.

Luke AFB was selected over the other alternatives after a consideration of the environmental impacts and largely because of its available facility and ramp capacity, which makes it the least expensive alternative. Similar capacity could exist at the other alternatives, but only at the expense of relocating existing or programmed missions. Also, Luke AFB has existing capacity available to base at least six squadrons of F-35A, which will be considered in future F-35A training basing decisions. In order to optimize efficient use of U.S. training assets, the Air Force intends to consolidate training for F-35 pilots from seven partner nations at the first PTC which, by this decision, will be located at Luke AFB. Additional potential noise impacts would occur at all of the alternative locations and, while Luke AFB's potential additional noise impacts exceed those of Holloman, those potential impacts are less than those projected for Boise AFB or Tucson AFB. Finally, potential noise impacts at Luke AFB are uniquely well suited to be managed due to proactive land-use restrictions and mandatory noise attenuation requirements adopted by the State of Arizona and the communities around Luke AFB.

Three squadrons (72 PAA) will be based at Luke AFB by this decision because three squadrons represent the traditional span of control for an Air Force training wing. A decision to bed down more than three squadrons at this time is not prudent given fiscal and acquisition uncertainties.

Public Involvement

The public involvement accomplished by the Air Force is discussed in the FEIS (Volume I for each alternative and Volume II, Appendices A and D). Public notices and meetings were accomplished as follows:

Scoping period - January 25, 2010 to May 17, 2010.

Notice of Availability (NOA) of Draft EIS, Federal Register, Vol. 77, page 2979-01, January 20, 2012.

Public hearings:

Weed, NM February 7, 2012

Roswell, NM February 8, 2012

Alamogordo, NM February 9, 2012

Litchfield Park, AZ February 13, 2012

El Mirage, AZ February 14, 2012

Sun City, AZ February 15, 2012

Gila Bend, AZ February 16, 2012

Sierra Vista, AZ February 21, 2012

Tucson, AZ February 22 and 23, 2012

Boise, ID February 27 and 28, 2012

Marsin, ID February 29, 2012

NOA of Final EIS, Federal Register Vol. 77, page 35961-01, June 21, 2012 (began the 30-day wait period before this ROD was signed).

Agency Consultation and Coordination

As set out more completely in the FEIS, Appendix C, the Air Force consulted and coordinated with Federal and State agencies. These agencies reviewing biological and cultural resources were contacted early in the environmental planning process and received Air Force notification in February 2010. Air Force consulted on all of the alternatives in the EIS. This decision's regulatory consultations included informal Section 7 consultation in compliance with the Endangered Species Act, which was initiated with U.S. Fish and Wildlife Service (USFWS) on October 24, 2011. The USFWS issued a letter indicating a finding of may affect but not likely to adversely affect federally listed or proposed species, or critical habitat, for the proposed action on April 26, 2012. Contact with the Arizona State Historic Preservation Office was initiated on February 3, 2010. Section 106 consultation was initiated on January 12, 2012, pursuant to the National Historic Preservation Act and resulted in a finding of no adverse effect on May 1, 2012.

The Air Force coordinated with the FAA and the USMC. The Air Force also completed government-to-government consultations with potentially affected Native American tribes.

Mitigations and Management Actions

Specific management actions (those required by regulation or previous Air Force guidance) to facilitate the implementation of the Proposed Action have been identified and will be implemented (see FEIS §§ 2.8 and 2.9). These measures also include continuation of ongoing operational restrictions and avoidance measures. These measures are summarized below by applicable environmental resources. There are no mitigation actions (those adopted by the Air Force as a result of this decision independent of regulation or previous Air Force guidance).

The Air Force will accommodate for growth in understanding F-35A training activities by incorporating an adaptive management program (ADP) approach to the on-going basing of the F-35A aircraft and the training of personnel to fly and maintain the F-35A, over the life of system at Luke

AFB. As generally discussed in the FEIS (page 1-8), the ADP will focus on the F-35A PTC and will incorporate, but not be limited to, the following types of adaptive management:

> Noise models that have been developed or will be developed in the future will be used to reveal and understand the potential effects of policies, activities, or practices that are being considered for implementation in the F-35A aircraft ramp-up to final operation capability.
>
> Management and oversight activities reveal, through monitoring and evaluation of results, the accuracy or completeness of the earlier predictions. Adaptations can be developed to eliminate or reduce effects.

Air Force has strived to accurately predict potential impacts and anticipate future conditions using the best available data, information, and tools at the time of the FEIS (see also, Determination of Whether All Practical Means to Avoid or Minimize Environmental Harm Have Been Adopted, below). However, given the programmatic nature and relative immaturity of the F-35 program, identification of new data and information relative to the F-35 (and specifically the F-35A), becomes a frequent occurrence. Consequently, it is possible for the impacts identified and the effectiveness of mitigation implementation measures to be different than expected; and adaptive management techniques are well-suited to such circumstances.

Although adaptive management is intended to work within the bounds of the existing FEIS, some issues and/or adaptations may require additional NEPA analysis, such as those that would result in a substantial change to the action. This type of issue will be dealt with on a case-by-case basis.

In addition, the Air Force will prepare a Mitigation and Monitoring Plan (MMP). The following additional steps are examples of what the MMP will address:

> Provisions that establish the specific ADP for the F-35A PTC,
>
> Identify the type of monitoring for the action and each mitigation,
>
> Identify how the monitoring will be executed,
>
> Identify the timing for mitigation implementation,
>
> Identify who will fund and oversee mitigation implementation, and
>
> Establish the process and responsibilities for identifying and making changes to the action or mitigations to influence beneficial results or avoid/reduce adverse ones.

For those resources area where potential impacts have not been mitigated by avoidance (i.e., through project design), additional planned management actions are summarized below:

Airspace Management and Use

> Coordinate with the FAA Air Route Traffic Control Centers and other FAA entities to minimize conflicts with civil and commercial aviation.
>
> Avoid airports and airfields underlying military airspace using standard procedures.

Noise

Adhere to all existing FAA, applicable U.S. Fish and Wildlife Service Biological Opinions, and local avoidance procedures, flight restrictions, scheduling adjustments, and other practices designed to reduce aircraft noise.

Use of flight simulators for some training.

Air Quality

Employ fugitive dust control and soil retention practices, including the following:

Use water trucks or sprinkler systems to keep all areas of vehicle movement damp enough to prevent dust from leaving the construction area.

Suspend all soil disturbance activities when winds exceed twenty-five miles per hour or when visible dust plumes emanate from the site.

Safety

Develop F35A and location-specific emergency fuel dumping procedures based on current aircraft procedures.

Soils and Water

Sequence construction activities to limit soil exposure so it will not last for long periods.

Update installation Storm Water Pollution Prevention Plans to reflect new F35A building construction as required by state and federal Clean Water Act requirements.

Manage onsite storm water and prevent discharges into nearby surface waters through site planning with low-impact design principles and engineered storm water retention ponds (or swales).

Install gravel pads at access points for construction area to prevent tracking of soil onto paved roads.

Vegetation and Wildlife

Avoid spreading invasive nonnative species; preclude vehicles from driving in areas with known invasive nonnative species problems.

Threatened, Endangered, and Special Status Species

Maintain quarter-mile overflight avoidance altitudes of Mexican spotted owl protected activity centers as stated in informal consultation with USFWS.

Comply with BMGR Integrated Natural Resource Management Plan mitigation/management measures and any other mitigation and management measures applicable via Section 7 consultation to BMGR.

Cultural Resources

Continue to avoid, to the extent practicable, identified seasonally sensitive Native American ceremonies or other seasonal activities.

Implement tracking of the results of government-to-government consultation with Native American tribes.

Infrastructure

Incorporate LEED [Leadership in Energy and Environmental Design] and sustainable development concepts into construction projects to achieve optimum resource efficiency, sustainability, and energy conservation, except to the extent limited or prohibited by law.

Continue and enhance recycling and reuse programs to accommodate waste generated by the F35A beddown.

Transportation

Reduce any potential congestion associated with the beddown through offbase state and local traffic improvement construction projects.

Hazardous Materials and Waste

Update established procedures and implement updates for managing hazardous materials and wastes associated with F35A aircraft. By adding new hazardous materials needed by the F35A program and new satellite accumulation points for hazardous wastes, the Air Force would maintain compliance with state and federal regulations.

Determination of Whether All Practical Means to Avoid or Minimize Environmental Harm Have Been Adopted

The Air Force considered all practicable means to avoid or minimize environmental harm. The following noise mitigation measures were considered and evaluated but were either not operationally workable or did not substantially reduce noise impacts, and therefore are not considered to be practicable at this time.

The F35A aircraft is at an early stage of overall life-cycle development and data sets as to its performance and other characteristics will undergo change as the aircraft is adapted to the Air Force mission and flying conditions at Luke AFB. As the F35A aircraft beddown at Luke AFB progresses, operational reviews, such as those that occur during an Air Installation Compatible Use Zone study update, would include consideration of additional operational modifications to reduce noise levels.

Construction of major runway infrastructure: Construction of new or major improvements to runways was not considered in the initial screening of locations for alternatives in this EIS. F35A beddown locations were selected based on current infrastructure.

Changing aircraft performance: Reducing aircraft wing flap settings, delaying flap extension, using unusually high speeds during aircraft landing approaches, or using reduced

thrust (i.e., lowering of power settings) are not operationally feasible or safe in a training environment. These unsafe training actions were not carried forward as potential mitigations.

Reducing the number of late-night operations: After dark operations between 10:00 p.m. and 7:00 a.m. are needed to accomplish required night training within required time limitations. Student pilot training must continue during summer months, when the sun does not set until relatively late. During these months, some runway approach operations would be conducted after 10:00 p.m. At each potential beddown installation, several operational scheduling factors were considered in estimating the number of late night operations expected to occur. To the extent possible, such scheduling has already been incorporated into the projected flight operations. Scheduling would not be able to further reduce the overall number of late night operations for pilot training.

Reduced use of afterburners: Afterburner use during departure is required for heavy aircraft loads that must be carried to accomplish certain training missions. The number of afterburner departures reflects training requirements that would be adversely affected by a reduction in such operations.

Reduction of the number of practice approaches: The F35A training syllabus requires a number of practice approaches to provide a well-rounded and comprehensive training curriculum for student pilots. Reducing the number of practice approaches would not be operationally possible for the production of trained pilots.

Noise attenuation: Existing structures can have noise attenuation added by replacing or upgrading individual building components (doors, windows, walls, etc.) with components that have an increased ability to absorb or reflect sound energy. The Air Force is not authorized to expend operational funds for offbase structural noise attenuation, nor does it have other mechanisms for increasing structural noise attenuation.

Other adversary aircraft: Use of an aircraft other than the F35A as an adversary aircraft during mock engagements or as a chase aircraft during early-syllabus student flights is an option that has been considered. However, the level of use of such assets cannot be accurately predicted or committed to at this time.

Auxiliary airfield flight procedures: Modification of aircraft flight procedures at auxiliary fields is not feasible given the tightly scripted nature of practice approaches. Deviating from standard approach flight tracks would greatly reduce or eliminate the training utility of the practice approaches.

Additional avoidance areas: Establishing additional avoidance areas in the training airspace would require additional tasks for training pilots to accomplish during low-altitude flight. New avoidance areas would not be ideal nor advance safety for training pilots. No additional avoidance areas are proposed at this time.

Modify approach or departure tracks: Flight tracks in the vicinity of Luke AFB are limited by rising terrain and Phoenix Sky Harbor Airport airspace which Air Traffic Control uses regularly for transit of aircraft. Maneuvers to the west of the installation are limited by the White Tank Mountains. To ensure safety of flight near an airfield, a minimum distance must be maintained above ground elevation. One procedure that was considered would have added a 10-degree turn towards the west at two nautical miles past the runway end while departing towards the south. This potential mitigation was compared with operations

presented in the FEIS and no substantial noise reduction benefits were achieved compared to standard procedures.

Implement additional altitude hold-downs during departure: Aircraft departing Luke AFB are sometimes required by Air Traffic Control to stop climbing temporarily to deconflict from Phoenix Sky Harbor approach corridors. Adding additional aircraft altitude hold-downs would allow aircraft to reduce engine power setting and noise while near the installation. However, rising terrain near Luke AFB does not permit safe hold-downs at altitudes that would provide substantial noise impact reductions.

Conduct larger percentage of required practice approaches at Gila Bend AFAF rather than Luke AFB or Aux-1: Luke AFB makes extensive use of both of its auxiliary airfields to provide the most efficient training. Shifting operations from one location to another would reduce training efficiency, result in potential delays, increase non-productive fuel burn, and shift potential noise impacts from one population to another population. Different use of auxiliary fields was not found to have noise or operational benefits.

Changing percent of operations to the north rather than to the south: Runway selection at Luke AFB is currently made for safety reasons based on actual or forecasted wind. The most critical phases of flight are takeoff and landing. Normal procedure is to take off and land into the wind so relative groundspeed is reduced and available runway is maximized. The margin of safety is substantially reduced if these operations are conducted with a tailwind where the available runway is minimized and high-energy states increase the likelihood of blown tires and brake fires. Changing training procedures to launch with up to a 10-knot tailwind is not considered acceptable for F16 pilot training at Luke AFB, and would likewise not be acceptable for F35A pilot training. Changing runways mid-day requires changing safety barriers with possible delays in aircraft operations. Selection of runway direction for reasons other than wind direction would increase the likelihood of training pilots being forced to accept unsafe tailwind conditions.

Shift departure operations from Runway 21L to 21R: Luke AFB has parallel runways. Due to the location of aircraft ramps, aircraft departing Runway 21R would need to taxi further and cross an active runway (Runway 21L) to reach the departure runway. This would result in increased fuel burn, aircraft system heating, and potential for training delays of up to 10 or more minutes as each aircraft waited for a clear runway. Training delays could have far-reaching implications for the overall training schedule once Luke AFB is supporting a large number of assigned aircraft and training time on the munitions training ranges becomes more limited. In addition, shifting departure operations to Runway 21R would require certain second approach operation maneuvers to be conducted to the east rather than the west of the airfield. Such a second approach would expose more people to overflight noise. Shifting departure operations from Runway 21L to 21R would impact flight operations and would not reduce noise levels over populated areas.

Unavoidable Impacts Taken into Consideration in the Decision

As discussed above, multiple potential mitigations have been reviewed and rejected as being not practicable. After the inclusion of management actions, a number of primarily noise unavoidable adverse impacts will still occur, along with impacts to land for on-base construction.

Findings

Upon review of the FEIS after publication, several noise values were found to be inaccurate (see attached errata sheet). These differences are not deemed significant enough to warrant additional public comment.

The two squadrons of U.S. F-16 aircraft presently based at Luke AFB, which are not subject to a previous decision to relocate to Holloman AFB, will remain at Luke AFB for the time being. The combined environmental impacts of the F-35A aircraft and these two squadrons of U.S. F-16 aircraft were analyzed and compared to the impacts presented to the public. As the combined impacts are less than those presented to the public in conjunction with the L-6 scenario, this change is not deemed significant or relevant from an environmental perspective and thus supplementation of the EIS will not be conducted. However, should real-time operations prove to be inconsistent with those presupposed in the EIS, the adaptive management measures will be utilized to determine if further environmental analysis is warranted.

Approved by:

Kathleen I. Ferguson — 1 Aug 2012

Signature — Date

Kathleen I. Ferguson, P.E.

Deputy Assistant Secretary of the Air Force

(Installations)

Errata Sheet for the Final EIS released in June 2012

FINAL F-35A TRAINING BASING ENVIRONMENTAL IMPACT STATEMENT

The following are changes to the Final EIS.

EXECUTIVE SUMMARY	
PAGE 70, *Summary Table, Boise AGS (Base), Noise, Speech Interference*	Changed "factor of 4, 8, and 11" to "factor of 6, 9, and 13"
PAGE 71, *Summary Table, Tucson AGS (Base), Noise, Speech Interference*	Changed "increase by 11%, 92%, and 172%" to "increase by 11%, 100%, and 189%"
VOLUME I	
CHAPTER 2	
PAGE 2–30, *Table 2–12, Boise AGS (Base), Noise, Speech Interference*	Changed "factor of 4, 8, and 11" to "factor of 6, 9, and 13"
PAGE 2–30, *Table 2–12, Tucson AGS (Base), Noise, Speech Interference*	Changed "increase by 11%, 92%, and 172%" to "increase by 11%, 100%, and 189%"
CHAPTER 4 - BOISE	
PAGE BO–30, *Paragraph 3, Line 5*	Changed "factor of 5, 8, and 12" to "factor of 6, 9, and 13"
CHAPTER 4 - LUKE	
PAGE LU–29, *Table 3.2–1*	
Scenario L4 (96 Aircraft), 75–79, Population Affected (On-Installation), Number	Changed "32" to "64"
Scenario L4 (96 Aircraft), 75–79, Population Affected (On-Installation), Change	Changed "32" to "64"
Scenario L5 (120 Aircraft), 65–69, Population Affected (On-Installation), Number	Changed "638" to "612"
Scenario L5 (120 Aircraft), 65–69, Population Affected (On-Installation), Change	Changed "(90)" to "(116)"
Scenario L5 (120 Aircraft), 70–74, Population Affected (On-Installation), Number	Changed "128" to "638"
Scenario L5 (120 Aircraft), 70–74, Population Affected (On-Installation), Change	Changed "(63)" to "447"
Scenario L5 (120 Aircraft), 75–79, Population Affected (On-Installation), Number	Changed "64" to "128"
Scenario L5 (120 Aircraft), 75–79, Population Affected (On-Installation), Change	Changed "64" to "128"
PAGE LU–36, *Paragraph 1, Line 15*	Changed "decrease under Scenarios L1 and L2 but would increase under Scenarios L3, L4, L5, and L6 by 7, 22, 44, and 71 percent" to "decrease under Scenarios L1, L2, and L3 but would increase under Scenarios, L4, L5, and L6 by 22, 44, and 71 percent"
CHAPTER 4 - TUCSON	
PAGE TU–29, *Paragraph 1, Line 4*	Changed "32 percent under Scenario T3" to "39 percent under Scenario T3"

Table 57. Comparative Summary of Environmental Consequences

Boise AGS		Holloman AFB Scenarios H1W, H2W, H3W		Holloman AFB Scenari
(Base)	**(Airspace)**	**(Base)**	**(Airspace)**	**(Base)**
Airspace Management & Use (Corresponds with Final EIS Chapter 4, Base-Specific Sections 3.1)				
• Operational increases resulting from all basing scenarios could be accommodated by the current air traffic management system within existing airspace without adverse impacts.	• No modifications would be required for airspace structure or airport flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected. Detailed scheduling and prioritization would continue to be required between the respective scheduling agencies to help ensure all training and other mission requirements are met.	• Same as Boise AGS.	• No modifications would be required for airspace structure or airfield flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected. Procedures and processes currently being implemented to improve scheduling for this airspace to meet all test, training, and other operational needs would be used to ensure all organizational requirements are met.	• Same as Boise AGS.
Noise (Corresponds with Final EIS Chapter 4, Base-Specific Sections 3.2)				
• ***Additional Annoyance:*** Off-installation/airport residents affected by ≥65 decibels (dB) day–night average sound level (DNL) would increase from 142 to 3,104; 5,470; and 10,119 persons, or, with mitigations, to 2,547, 3,956 and 5,886 persons, under Scenarios B1, B2, and B3, respectively. Off-installation acres affected by ≥65 dB DNL would increase from 89 to 3,032; 5,038; and 6,958 under Scenarios B1, B2, and B3, respectively. • ***Speech Interference:*** Cumulative average events per daytime hour with potential to interfere with speech would increase by a factor of 6, 9, and 13 relative to baseline conditions under Scenarios B1, B2, and B3, respectively, at locations studied with windows closed. • ***Classroom Impacts:*** American National Standards Institute (ANSI) standards for new school construction may not be met at 1, 2, and 4 of the 4 schools studied under Scenarios B1, B2, and B3, respectively. • ***Sleep Disturbance:*** Cumulative average percentage of persons awakened at least once per night among all locations studied with windows closed would increase by 33%, 17%, and 31% under Scenarios B1, B2, and B3, respectively. • ***Potential Hearing Loss:*** Off-installation/airport residents affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) would increase from 0 to 68, 164, and 313 under Scenarios B1, B2, and B3, respectively. No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.	• ***Subsonic Noise:*** The onset rate-adjusted monthly day–night average sound level (DNL_{mr}) beneath Special Use Airspaces (SUAs) would increase by up to 5, 7, and 9 dB under Scenarios B1, B2, and B3, respectively, but would equal or exceed 65 dB only beneath Jarbidge North and Owyhee Military Operations Areas (MOAs), Restricted Area 3202 (R-3202), and R-3204 under Scenarios B1, B2, and B3. • DNL_{mr} beneath Military Training Routes (MTRs) would increase between 3 and 5 dB under Scenarios B1, B2, and B3, respectively, and would exceed 65 dB under Instrument Route (IR)-301/307 and IR-392/305 under all three F-35A scenarios. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in section 3.2 could increase from 12 to up to 17 percent with Scenario B3. • ***Supersonic Noise:*** The C-weighted DNL (CDNL) would increase by 1 dB or less beneath primary training SUAs in which supersonic training is allowed. Average number of sonic booms would increase by <1 per day. • ***Munitions Noise:*** F-35A would conduct inert weapons training at Saylor Creek and Juniper Butte Ranges. Inert bombs generate minimal noise and would not result in significant impacts. Live weapons training would be conducted at Utah Test and Training Range (UTTR). Increases in munitions noise levels at UTTR would not be noticeable in the context of ongoing munitions testing and training.	• ***Additional Annoyance:*** Off-installation residents affected by ≥65 dB DNL would decrease by approximately 1 person under Scenarios H1W, H2W, and H3W. Off-installation acres affected by ≥65 dB DNL would increase from 7,307 to 9,304; 10,880; and 12,283 under Scenarios H1W, H2W, and H3W, respectively. • ***Speech Interference:*** Cumulative average events with potential to interfere with speech would increase by 8%, 20%, and 35% under Scenarios H1W, H2W, and H3W, respectively, at locations studied with windows closed. • ***Classroom Impacts:*** ANSI standards for new school construction may not be met at either of the 2 schools studied under any scenario or under baseline conditions. • ***Sleep Disturbance:*** Cumulative average percentage of persons awakened at least once per night among all locations studied with windows closed would decrease or remain the same under all scenarios. • ***Potential Hearing Loss:*** No off-installation residents would be affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) under any scenario. No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.	• ***Subsonic Noise:*** DNL_{mr} beneath SUAs would increase by up to 5, 8, and 9 dB under Scenarios H1W, H2W, and H3W, respectively. DNL_{mr} would equal or exceed 65 dB beneath Red Rio and Oscura Range airspace units under Scenarios H2W and H3W, as well as beneath Yonder airspace under Scenario H3W. • DNL_{mr} beneath MTRs would increase by up to 3, 4, and 5 dB under Scenarios H1W, H2W, and H3W, respectively, but would not exceed 65 dB under any scenario. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in section 3.2 could increase from 5 to up to 13 percent with Scenario H3W. • ***Supersonic Noise:*** CDNL would increase by 2 dB or less beneath primary training SUAs in which supersonic training is allowed. Average number of sonic booms would increase by <1 per day. • ***Munitions Noise:*** F-35A would conduct munitions training with live and inert munitions at Red Rio, Centennial, and Oscura Ranges. Noise generated by live munitions usage may be audible in off-range locations, but would be relatively infrequent. • ***Auxiliary Airfield (Roswell International Air Center [RIAC]):*** The approximate number of residents affected by ≥65 dB DNL would increase from 61 to 169, 255, and 358 persons under Scenarios H1W, H2W, and H3W, respectively. The number of	• ***Additional Annoyance:*** Off-installation residents affected by ≥65 dB DNL would decrease by approximately 5 persons under Scenarios H1, H2, H3, H4, and H5. Off-installation acres affected by ≥65 dB DNL would decrease under Scenario H1. Under Scenarios H2, H3, H4, and H5, off-installation acres exposed to ≥65 dB DNL would increase from 7,307 to 8,025; 9,438; 10,721; and 11,833 acres, respectively. • ***Speech Interference:*** Cumulative average events with potential to interfere with speech would decrease under Scenarios H1 and H2, but would increase by 5%, 22%, and 39% under Scenarios H3, H4, and H5, respectively, at locations studied with windows closed. • ***Classroom Impacts:*** ANSI standards for new school construction may not be met at either of the 2 schools studied under any scenario or under baseline conditions. • ***Sleep Disturbance:*** Cumulative average percentage of persons awakened at least once per night among all locations studied with windows closed would decrease under all scenarios. • ***Potential Hearing Loss:*** No off-installation residents would be affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) under any scenario. No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.

ios H1, H2, H3, H4, H5	Luke AFB		Tucson AGS	
(Airspace)	(Base)	(Airspace)	(Base)	(Airspace)
• Same as Holloman AFB Scenarios H1W, H2W, and H3W.	• Same as Boise AGS.	• No modifications would be required for airspace structure or airfield flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected.	• Operational increases resulting from Scenarios T1 and T2 could be accommodated by the current air traffic management system within existing airspace without adverse impacts. Under Scenario T3, the projected annual military airfield operations would exceed the maximum number allowed as per agreement with the Tucson Airport Authority. The agreement would need to be renegotiated to allow for additional airfield operations.	• No modifications would be required for airspace structure or airport flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected.
• ***Subsonic Noise:*** DNL_{mr} beneath SUAs would increase by up to 4, 7, 9, 10, and 11 dB under Scenarios H1, H2, H3, H4, and H5, respectively, and would equal or exceed 65 dB under 0, 0, 3, 5, and 6 of the 11 primary use SUAs under Scenarios H1, H2, H3, H4, and H5, respectively. • DNL_{mr} beneath MTRs would increase by up to 3, 4, 5, 6, and 7 dB under Scenarios H1, H2, H3, H4, and H5, respectively, but would not exceed 65 dB under any scenario. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in section 3.2 could increase from 9 to up to 17 percent with Scenario H5. • ***Supersonic Noise:*** CDNL would decrease beneath all primary training SUAs in which supersonic training is allowed, except beneath McGregor Range airspace units, where it would increase by up to 3 dB. Average number of sonic booms would increase by <1 per day or decrease. • Individuals at DEIS hearings expressed annoyance with existing sonic booms and anticipated increased annoyance with additional sonic booms. • ***Munitions Noise:*** F-35A would conduct munitions training with live and inert munitions at Red Rio, Centennial, and Oscura Ranges. Noise generated by live munitions usage may be audible in off-range locations, but would be relatively infrequent. • ***Auxiliary Airfield (RIAC):*** The approximate number of residents affected by ≥65 dB DNL would increase from 61 to 66, 164, 247,	• ***Additional Annoyance:*** Off-installation residents affected by ≥65 dB DNL would decrease under Scenarios L1, L2, and L3, but would increase from 1,601 to 2,223; 3,216; and 5,340 under Scenarios L4, L5, and L6, respectively. Off-installation acres affected by ≥65 dB DNL would decrease under Scenarios L1 and L2, but would increase from 7,042 to 7,916; 9,398; 10,679; and 11,651 under Scenarios L3, L4, L5, and L6, respectively. • ***Speech Interference:*** Cumulative average events with potential to interfere with speech would decrease under Scenarios L1, L2, and L3, but would increase by 22%, 44%, and 71% under Scenarios L4, L5, and L6, respectively, at locations studied with windows closed. • ***Classroom Impacts:*** ANSI standards for new school construction may not be met at 1 of the 5 schools studied under Scenarios L1 and L2, at 2 schools under Scenario L3, and at 3 schools under Scenarios L4, L5, and L6. • ***Sleep Disturbance:*** Cumulative average percentage of persons awakened at least once per night averaged among all locations studied with windows closed would decrease under all scenarios. • ***Potential Hearing Loss:*** Off-installation/airport residents affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) would decrease under Scenarios L1 and L2, but would increase from 2 to 5, 8, 12, and 14 persons under Scenarios L3, L4, L5, and L6, respectively. No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.	• ***Subsonic Noise:*** DNL_{mr} beneath SUAs would increase by up to 3, 6, 7, 9, 10, and 10 dB under Scenarios L1, L2, L3, L4, L5, and L6, respectively, and would exceed 65 dB beneath 0, 2, 3, 3, 4, and 4 of the 6 primary use SUAs under Scenarios L1, L2, L3, L4, L5, and L6, respectively. • DNL_{mr} beneath MTRs would increase by up to 11, 14, 16, 17, 18, and 19 dB under Scenarios L1, L2, L3, L4, L5, and L6, respectively, but would not exceed 65 dB under any scenario. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in section 3.2 could increase from 7 to up to 21 percent with Scenario L6. • ***Supersonic Noise:*** CDNL would decrease beneath all primary training SUAs in which supersonic training is allowed. Average number of sonic booms per day would decrease or remain the same under all scenarios. • ***Munitions Noise:*** F-35A would conduct munitions training with live and inert munitions at Barry M. Goldwater Range (BMGR). Noise generated by live munitions usage may be audible in off-range locations, but would be relatively infrequent. • ***Auxiliary Airfield (Gila Bend Air Force Auxiliary Field [Gila Bend AFAF]:*** Off-installation residents affected by ≥65 dB DNL would decrease under Scenario L1, but would increase from 3 to 5, 9, 11, 13, and 15 persons under Scenarios L2, L3, L4, L5, and L6,	• ***Additional Annoyance:*** Off-installation/airport residents affected by ≥65 dB DNL would increase from 407 to 1,918; 4,378; and 8,534 persons under Scenarios T1, T2, and T3, respectively. Off-installation/airport acres affected by ≥65 dB DNL would increase from 500 to 1,200; 1,942; and 2,938 under Scenarios T1, T2, and T3, respectively. • ***Speech Interference:*** Cumulative average events per daytime hour with potential to interfere with speech would increase by 11%, 100%, and 189% under Scenarios T1, T2, and T3, respectively, at locations studied with windows closed. • ***Classroom Impacts:*** ANSI standards for new school construction may not be met at 1, 2, and 4 of the 5 schools studied under Scenarios T1, T2, and T3, respectively. • ***Sleep Disturbance:*** Cumulative average percentage of persons awakened at least once per night among all locations studied with windows closed would increase by 16% under Scenarios T1 and T2 and by 23% under Scenario T3. • ***Potential Hearing Loss:*** No off-installation residents would be affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) under any scenario. No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.	• ***Subsonic Noise:*** DNL_{mr} beneath SUAs would increase by up to 3, 6, and 8 dB under Scenarios T1, T2, and T3, respectively, but would not exceed 65 dB under any scenario. • DNL_{mr} beneath the primary use MTR would increase by 11, 14, and 16 dB under Scenarios T1, T2, and T3, respectively, but would not exceed 65 dB under any scenario. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in section 3.2 could increase from 7 to up to 11 percent with Scenario T3. • ***Supersonic Noise:*** CDNL would decrease beneath all primary training SUAs in which supersonic training is allowed. Average number of sonic booms per day would decrease beneath all primary training SUAs. • ***Munitions Noise:*** F-35A would conduct munitions training with live and inert munitions at BMGR. Noise generated by live munitions usage may be audible in off-range locations, but would be relatively infrequent. • ***Auxiliary Airfield (Libby Army Airfield [Libby AAF]):*** No off-installation residents would be affected by ≥65 dB DNL under any scenario. Off-installation area affected by ≥65 db DNL would be limited to land owned by the Sierra Vista Municipal Airport.

Boise AGS **(See Chapter 4, Section BO)** **Scenario B1 = 24 F-35As** **Scenario B2 = 48 F-35As** **Scenario B3 = 72 F-35As** **18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3**	**Holloman AFB** **(See Chapter 4, Section HO)** **Scenario H1W = 24 F-35As** **Scenario H2W = 48 F-35As** **Scenario H3W = 72 F-35As**	**Holloman AFB** **(See Chapter 4, Section HO)** **Scenario H1 = 24 F-35As** **Scenario H2 = 48 F-35As** **Scenario H3 = 72 F-35As** **Scenario H4 = 96 F-35As** **Scenario H5 = 120 F-35As**	**Luke AFB** **(See Chapter 4, Section LU)** **Scenario L1 = 24 F-35As** **Scenario L2 = 48 F-35As** **Scenario L3 = 72 F-35As** **Scenario L4 = 96 F-35As** **Scenario L5 = 120 F-35As** **Scenario L6 = 144 F-35As** **Replace 142 F-16s; 26 FMS F-16s remain**	**Tucson AGS** **(See Chapter 4, Section TU)** **Scenario T1 = 24 F-35As** **Scenario T2 = 48 F-35As** **Scenario T3 = 72 F-35As** **18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3**
Noise (Corresponds with Chapter 4, Base-Specific Sections 3.2)				
Base Additional Annoyance: • Off-installation/airport residents affected by ≥65 decibels (dB) day–night average sound level (DNL) would increase from 142 to 3,104; 5,470; and 10,119 persons, or, with mitigations, to 2,547; 3,956; and 5,886 persons, under Scenarios B1, B2, and B3, respectively. • Off-installation acres affected by ≥65 dB DNL would increase from 89 to 3,032; 5,038; and 6,958 acres under Scenarios B1, B2, and B3, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would increase by a factor of 6, 9, and 13 relative to baseline conditions under Scenarios B1, B2, and B3, respectively, at locations studied with windows closed.	**Base** Additional Annoyance: • Off-installation residents affected by ≥65 dB DNL would decrease by approximately 1 person under Scenarios H1W, H2W, and H3W. • Off-installation acres affected by ≥65 dB DNL would increase from 7,307 to 9,304; 10,880; and 12,283 acres under Scenarios H1W, H2W, and H3W, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would increase by 8%, 20%, and 35% under Scenarios H1W, H2W, and H3W, respectively, at locations studied with windows closed.	**Base** Additional Annoyance: • Off-installation residents affected by ≥65 dB DNL would decrease by approximately 5 persons under Scenarios H1, H2, H3, H4, and H5. • Off-installation acres affected by ≥65 dB DNL would decrease under Scenario H1. Under Scenarios H2, H3, H4, and H5, off-installation acres exposed to ≥65 dB DNL would increase from 7,307 to 8,025; 9,438; 10,721; and 11,833 acres, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would decrease under Scenarios H1 and H2, but would increase by 5%, 22%, and 39% under Scenarios H3, H4, and H5, respectively, at locations studied with windows closed.	**Base** Additional Annoyance: • Off-installation residents affected by ≥65 dB DNL would decrease under Scenarios L1, L2, and L3, but would increase from 1,601 to 2,223; 3,216; and 5,340 persons under Scenarios L4, L5, and L6, respectively. • Off-installation acres affected by ≥65 dB DNL would decrease under Scenarios L1 and L2, but would increase from 7,042 to 7,916; 9,398; 10,679; and 11,651 acres under Scenarios L3, L4, L5, and L6, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would decrease under Scenarios L1, L2, and L3, but would increase by 22%, 44%, and 71% under Scenarios L4, L5, and L6, respectively, at locations studied with windows closed.	**Base** Additional Annoyance: • Off-installation/airport residents affected by ≥65 dB DNL would increase from 407 to 1,918; 4,378; and 8,534 persons under Scenarios T1, T2, and T3, respectively. • Off-installation/airport acres affected by ≥65 dB DNL would increase from 500 to 1,200; 1,942; and 2,938 acres under Scenarios T1, T2, and T3, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would increase by 11%, 100%, and 189% under Scenarios T1, T2, and T3, respectively, at locations studied with windows closed.

Descriptions of noise levels at the representative noise-sensitive locations also provide information relevant to surrounding land uses. For this reason, all noise metrics were calculated for all locations studied, even though some metrics are not directly relevant to a specific facility listed. For example, the percentage of persons awakened at least once per night is not directly relevant to a school or place of worship, but is relevant to residential areas, which tend to be located near schools and places of worship.

At the representative noise-sensitive locations studied, the DNL would increase by an amount ranging from 4 to 18 dB under Scenarios B1, B2, and B3. To put these increases in perspective, increases in instantaneous noise levels of 3 to 10 dB are typically described as "noticeable," and increases of more than 10 dB are typically described as "more than twice as loud." Under Scenario B1, the DNL at the Jehovah's Witnesses Kingdom Hall (Location No. 8) would increase from 68 dB DNL to 82 dB DNL, and the DNL at four additional noise-sensitive locations would increase to greater than 65 dB. Under Scenario B2, the DNL at 8 of the 17 locations studied would exceed 65 dB. The DNL at Location No. 8 would be 85 dB, and the DNL at the Boise AGS Chapel (Location No. 17) would be 75 dB. Under Scenario B3, the DNL at all locations studied except Church of JCLDS: Vista (Location No. 3), Frank Church High School (Location No. 7), Second Baptist Church (Location No. 11), Treasure Valley Full Gospel (Location No. 13), and West Junior High (Location No. 16) would exceed 65 dB. The noise level at Location No. 8 would be 86 dB DNL, and the noise level at Location No. 17 would be 76 dB.

Among all of the noise-sensitive locations studied, the cumulative average number of indoor events per daytime hour with windows open exceeding 50 dB L_{max} would increase by 90 percent under Scenario B1, 147 percent under Scenario B2, and 215 percent under Scenario B3. If windows are closed, the average number of noise events per daytime hour exceeding 50 dB L_{max} would increase by approximately a factor of 6, 9, and 13 relative to baseline conditions. Events exceeding 50 dB L_{max} have an increased likelihood of interfering with speech.

Of the four schools analyzed, only Owyhee Elementary (Location No. 15) would experience exterior $L_{eq(SD)}$ exceeding 65 dB under Scenario B1. Under Scenario B2, $L_{eq(SD)}$ would increase to greater than 65 dB at Hillcrest Elementary (Location No. 14) and Location No. 15. Under Scenario B3, the $L_{eq(SD)}$ at all four schools studied would increase to greater than 65 dB. Assuming that a typical school structure provides 25 dB outdoor-to-indoor noise level reduction with windows closed, schools experiencing an outdoor $L_{eq(SD)}$ that exceeds 65 dB may not meet the 2009 American National Standards Institute (ANSI) standard (40 dB in classroom) for at least a portion of 1 hour during a typical school day. F-35A operational schedules are not known at this time. In a hypothetical hour with twice the average daytime number of operations, L_{eq} would be 3 dB higher than the $L_{eq(SD)}$ listed in Table BO 3.2–3. Actual outdoor-to-indoor noise level reduction varies from school to school and between locations within individual schools.

The percentage of persons awakened from sleep by aircraft noise was estimated using the methodology described in Chapter 3, Section 3.2, for "windows open" and "windows closed" conditions. As described in Section BO 2.1.1, F-35A arrivals after 10:00 p.m. are expected to occur during approximately 10 percent of total F-35A sorties under Scenario B3. The percentage of total F-35A sorties returning after 10:00 p.m. would be lower under Scenarios B1 and B2 (9 percent of total). Under Scenario B1, the percentage of persons awakened at the locations

Table LU 3.2–1. Population and Acreage Under Noise Contours Near Luke AFB, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation)*		*Population Affected (On-Installation)*		*Total Area Affected (Off-Installation)*		*Total Area Affected (On-Installation)*	
	Number	**Change**	**Number**	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions								
Total ≥ 65	**1,601**	**N/A**	**919**	**N/A**	**7,042**	**N/A**	**2,302**	**N/A**
65–69	1,535	N/A	728	N/A	3,903	N/A	401	N/A
70–74	50	N/A	191	N/A	2,107	N/A	397	N/A
75–79	14	N/A	0	N/A	859	N/A	404	N/A
80–84	2	N/A	0	N/A	173	N/A	402	N/A
≥ 85	0	N/A	0	N/A	0	N/A	698	N/A
Scenario L1 (24 Aircraft)								
Total ≥ 65	**200**	**(1,401)**	**766**	**(153)**	**4,763**	**(2,279)**	**2,247**	**(55**)
65–69	149	(1,386)	638	(90)	3,173	(730)	425	24
70–74	38	(12)	128	(63)	1,309	(798)	413	16
75–79	13	(1)	0	0	278	(581)	516	112
80–84	0	(2)	0	0	3	(170)	371	(31
≥ 85	0	0	0	0	0	0	522	(176)
Scenario L2 (48 Aircraft)								
Total ≥ 65	**488**	**(1,113)**	**919**	**0**	**6,407**	**(635)**	**2,450**	**148**
65–69	415	(1,120)	472	(256)	4,078	175	483	82
70–74	50	0	447	256	1,744	(363)	420	23
75–79	21	7	0	0	561	(298)	484	80
80–84	2	0	0	0	24	(149)	443	41
≥ 85	0	0	0	0	0	0	620	(78)
Scenario L3 (72 Aircraft)								
Total ≥ 65	**1,181**	**(420)**	**1,021**	**102**	**7,916**	**874**	**2,628**	**326**
65–69	1,090	(445)	319	(409)	4,903	1,000	563	162
70–74	59	9	702	511	2,135	28	426	29
75–79	26	12	0	0	799	(60)	452	48
80–84	6	4	0	0	79	(94)	479	77
≥ 85	0	0	0	0	0	0	708	10
Scenario L4 (96 Aircraft)								
Total ≥ 65	**2,223**	**622**	**1,174**	**255**	**9,398**	**2,356**	**2,705**	**403**
65–69	2,111	576	408	(320)	5,749	1,846	559	158
70–74	71	21	702	511	2,488	381	435	38
75–79	32	18	64	64	1,010	151	424	20
80–84	9	7	0	0	151	(22)	502	100
≥ 85	0	0	0	0	0	0	785	87
Scenario L5 (120 Aircraft)								
Total ≥ 65	**3,216**	**1,615**	**1,378**	**459**	**10,679**	**3,637**	**2,769**	**467**
65–69	3,078	1,543	612	(116)	6,420	2,517	555	154
70–74	88	38	638	447	2,816	709	443	46
75–79	38	24	128	128	1,203	344	413	9
80–84	12	10	0	0	237	64	502	100
≥ 85	0	0	0	0	3	3	856	158
Scenario L6 (144 Aircraft)								
Total ≥ 65	**5,340**	**3,739**	**1,582**	**663**	**11,651**	**4,609**	**2,827**	**525**
65–69	5,158	3,623	796	68	6,793	2,890	560	159
70–74	125	75	594	403	3,154	1,047	442	45
75–79	42	28	192	192	1,367	508	410	6
80–84	15	13	0	0	332	159	496	94
≥ 85	0	0	0	0	5	5	919	221

Note: (Number) denotes a negative number.

ID No.	General Description[1]	Outdoor DNL[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]		Outdoor $L_{eq(SD)}$[2]		Percentage Awakened (windows open)[2]		Percentage Awakened (windows closed)[2]	
Scenario L6 (144 Aircraft)													
1	Residential Area No. 1	58	(-4)	10	(2)	6	(-1)	60	(-4)	6	(3)	4	(2)
2	Bill Gentry Baseball Park	62	(9)	12	(6)	8	(7)	63	(8)	3	(-8)	2	(2)
3	Cotton Lane Community Church	66	(3)	18	(7)	15	(5)	68	(3)	4	(2)	2	(1)
4	Residential Area No. 2	58	(-5)	10	(2)	8	(1)	60	(-4)	6	(3)	4	(2)
5	Residential Area No. 3	65	(-1)	18	(7)	11	(3)	67	(-1)	5	(2)	3	(1)
6	Luke Elementary School	64	(7)	16	(5)	11	(3)	66	(7)	2	(0)	1	(0)
7	Scott L Libby Elementary School	57	(-3)	10	(2)	5	(-2)	58	(-4)	5	(2)	3	(2)
8	Western Sky Middle School	54	(2)	11	(0)	9	(6)	56	(2)	2	(1)	0	(-1)
9	Desert Cove Assembly	67	(11)	15	(7)	12	(11)	69	(11)	3	(-12)	2	(1)
10	Jehovah's Witnesses Kingdom Hall	69	(5)	13	(6)	9	(6)	70	(6)	5	(-20)	3	(-13)
11	Sun Valley Mennonite Church	68	(5)	13	(6)	9	(7)	70	(7)	5	(-18)	3	(-12)
12	Sunset View Baptist Church	68	(5)	13	(6)	9	(7)	70	(7)	4	(-19)	3	(-12)
13	U.S. Air Force Hospital	70	(6)	16	(5)	13	(2)	72	(6)	3	(-2)	1	(-1)
14	Dysart Elementary School	66	(11)	14	(7)	8	(7)	68	(12)	3	(-11)	2	(1)
15	Sun Valley Christian School	69	(5)	13	(6)	9	(6)	70	(6)	5	(-19)	3	(-13)
16	Child Development Center	68	(6)	16	(5)	12	(1)	70	(7)	3	(-2)	1	(0)
17	Chapel Center	70	(4)	16	(5)	13	(2)	72	(5)	4	(1)	1	(-1)
18	Base Chapel	76	(6)	17	(0)	16	(5)	78	(6)	5	(-8)	2	(0)

[1] Locations presented in this table are provided to help understand the noise environment. This list is not meant to be inclusive of all noise-sensitive receptors in the affected environment.
[2] Numbers in parentheses indicate delta relative to baseline conditions.

Under Scenario L1, noise levels at all of the representative locations would be below 65 dB DNL except at the Jehovah's Witnesses Kingdom Hall (Location No. 10), the Sun Valley Christian School (Location No. 15), and the base chapel (Location No. 18). Changes in DNL at the representative noise-sensitive locations relative to baseline conditions would range from decreases of up to 8 dB to increases of up to 5 dB. The wide range of noise level changes at the various locations is primarily a result of predicted increases in the percentage of total sorties departing to the north. Increases in instantaneous noise levels of 3 to 10 dB are typically described as "noticeable," and increases of greater than or equal to 10 dB are typically described as "more than twice as loud." Under Scenarios L2, L3, L4, L5, and L6, 7, 9, 10, 12, and 12 of the 18 noise-sensitive locations studied would exceed 65 DNL. Among all locations studied, the average number of indoor noise events per hour exceeding 50 dB L_{max} would decrease under Scenarios L1, L2, and L3 with windows open. If windows are open, the average number of events among all locations studied would increase by 8 percent, 30 percent and 50 percent under Scenarios L4, L5, and L6, respectively. If windows are closed, the average number of events exceeding 50 dB L_{max} among all locations studied would decrease under Scenarios L1, L2, and L3 but would increase under Scenarios L4, L5, and L6 by 22, 44, and 71 percent, respectively (see Table LU 3.2–4).

ID No.	General Description[1]	Outdoor DNL[2]	Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]	Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]	Outdoor $L_{eq(SD)}$	Percentage Awakened (windows open)[2]	Percentage Awakened (windows closed)[2]
7	Asamblea Universal De Iglesias Pentecostales	63 (8)	11 (3)	9 (6)	65 (8)	30 (4)	5 (1)
8	Faith Assembly of God	67 (6)	12 (3)	9 (6)	69 (6)	32 (5)	7 (1)
9	Grace Temple Missionary Baptist Church	64 (4)	18 (7)	7 (5)	64 (6)	32 (5)	21 (3)
10	Holy Trinity Lutheran Church	52 (4)	8 (4)	4 (4)	53 (6)	4 (1)	1 (0)
11	Holy Trinity Lutheran Church	64 (5)	19 (4)	9 (8)	65 (7)	31 (5)	20 (3)
12	Iglesia De Dios Sinai	67 (8)	13 (3)	10 (5)	68 (8)	34 (5)	13 (2)
13	Lutheran Church of St. John The Baptist	62 (6)	11 (3)	9 (6)	64 (7)	26 (4)	1 (1)
14	Olivo Max & Encinas Manuel & Lopez	62 (7)	10 (3)	7 (4)	64 (7)	12 (2)	3 (1)
15	Tabernaculo Emanuel	66 (7)	11 (3)	9 (6)	68 (7)	25 (4)	6 (1)

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Overflights with sound levels exceeding 50 dB L_{max} have an increased likelihood of interrupting speech. Among all sensitive locations analyzed, the cumulative average number of indoor noise events per day exceeding 50 dB L_{max} would decrease by 21 percent under Scenario T1, increase by 9 percent under Scenario T2, and increase by 39 percent under Scenario T3 relative to baseline conditions with windows open. The number of events exceeding 50 dB L_{max} with windows closed would increase by 11 percent under Scenario T1, 100 percent under Scenario T2, and 189 percent under Scenario T3.

Under Scenario T1, the $L_{eq(SD)}$ (L_{eq} between 7:00 a.m. and 4:00 p.m.) would exceed 65 dB $L_{eq(SD)}$ only at Pima Community College of Aviation Technology (Location No. 6) but not at any of the other schools studied. Under Scenario T2, the Arizona Academy of Leadership (Location No. 2) and the Pima Community College of Aviation Technology would experience a noise level exceeding 65 dB $L_{eq(SD)}$ and under Scenario T3, all of the schools except Challenger Middle School (Location No. 3) would exceed 65 dB $L_{eq(SD)}$. Assuming that a typical school structure provides 25 dB outdoor-to-indoor noise level reduction with windows closed, schools experiencing an outdoor $L_{eq(SD)}$ that exceeds 65 dB may not meet the 2009 American National Standards Institute (ANSI) standard (40 dB in classroom) for at least a portion of 1 hour during a typical school day. F-35A operational schedules are not known at this time. In a hypothetical hour with twice the average daytime number of operations, L_{eq} would be 3 dB higher than the $L_{eq(SD)}$ listed in Table TU 3.2–3. Actual outdoor-to-indoor noise level reduction varies from school to school and between locations within individual schools.

Under all beddown scenarios, less than 6 percent of total aircraft operations at Tucson AGS/TUS would occur between the hours of 10:00 p.m. and 7:00 a.m., when most people are asleep. The probability of being awakened at least once per night by late-night aircraft noise was calculated using the methodology described in Chapter 3, Section 3.2, under

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Chapter 2:
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Chapter 3: Resource Definition and Methodology for Analysis → Chapter 3 defines the environmental resources that could potentially be affected by the Proposed Action and explains the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base Specific Information

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Final

F-35A Training Basing

Environmental Impact Statement

Volume I

June 2012

COVER SHEET
FINAL F-35A TRAINING BASING
ENVIRONMENTAL IMPACT STATEMENT

a. *Responsible Agency*: U.S. Air Force (Air Force)

b. *Cooperating Agencies*: Federal Aviation Administration and the Department of the Navy, U.S. Marine Corps

c. *Proposed Action*: The Proposed Action is to base a Pilot Training Center (PTC) and beddown up to 144 F-35A training aircraft at one or more existing alternative locations. The PTC would support the training of Air Force, cooperative international partners, and U.S. Foreign Military Sales pilots in the safe and effective operation of the F-35A. The Air Force has defined four alternative bases for consideration as the location of the F-35A PTC: Boise Air Terminal Airport Air Guard Station (Boise AGS), Idaho; Holloman Air Force Base (Holloman AFB), New Mexico; Luke Air Force Base (Luke AFB), Arizona; and Tucson International Airport Air Guard Station (Tucson AGS), Arizona. Each alternative base was evaluated to determine the range of F-35A aircraft scenarios the base would be capable of supporting. At Boise AGS and Tucson AGS, this Environmental Impact Statement (EIS) evaluated 24, 48, and 72 F-35A aircraft scenarios. The basing scenarios at Holloman AFB evaluate 24, 48, and 72 F-35A aircraft in addition to the baseline of the F-16 FTU. To provide for comprehensive NEPA planning, basing scenarios at Holloman AFB evaluate 24, 48, 72, 96, and 120 F-35A aircraft without the F-16 FTU. At Luke AFB, 24, 48, 72, 96, 120, and 144 F-35A aircraft scenarios were evaluated. Personnel changes and new or renovated facilities were determined based on the requirements at each base to accommodate the mission under each aircraft scenario. The F-35A would conduct flight operations in existing airspace and ranges in proximity to the alternative bases. Additional flight operations would be conducted on auxiliary airfields identified for each alternative.

d. *Inquiries*: For further information on this EIS, contact Kim Fornof, HQ AETC/A7CPP, 266 F Street West, Building 901, Randolph AFB, TX 78150-4319. Telephone inquiries may be made to Headquarters Air Education and Training Command at (210) 652-1961.

e. *Designation*: Final Environmental Impact Statement (EIS)

f. *Abstract*: This EIS was prepared by the Air Force in accordance with the National Environmental Policy Act of 1969 (42 *United States Code* [U.S.C.] 4321 et seq.), as implemented by the Council on Environmental Quality regulations (40 *Code of Federal Regulations* [CFR] 1500–1508), and Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process* (as promulgated in 32 CFR 989). This EIS assessed the environmental consequences of the alternatives on the following resource categories: airspace management and use, noise, air quality, safety, soils and water, vegetation and wildlife, wetlands and aquatic communities, threatened and endangered species, cultural resources, land use and recreation, socioeconomics, environmental justice, infrastructure, transportation, and hazardous materials and waste. Analysis established that no substantial adverse impacts on the following resource categories would result from implementing any of the alternatives or associated aircraft scenarios: airspace management and use, air quality (except for the Boise AGS 72-aircraft scenario), soils and water, vegetation and wildlife, wetlands and aquatic communities, land use and recreation, transportation, or hazardous materials and waste. Training overflights may affect, but are not likely to adversely affect, threatened and endangered species. At Boise AGS, Luke AFB, and Tucson AGS, noise levels generated by the F-35A in the vicinity of the main airfields would adversely impact the exposed population, subsequently resulting in potentially adverse impacts on residents, property values, and environmental justice communities, including children. Noise generated at the Roswell International Air Center, El Paso International Airport, and Biggs Army Airfield auxiliary airfields would generate adverse impacts under the Holloman AFB alternative. Low-level training overflights in some locations could result in increased annoyance for persons under the training airspace. Personnel changes at Holloman AFB would create potential adverse impacts on infrastructure, particularly water, and housing. Construction expenditures and personnel changes would generate beneficial socioeconomic impacts on the surrounding communities by generating additional jobs and income.

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Acronyms

Acronyms

°F	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
AAF	Army Airfield
AATC	Air Force Reserve Command Test Center
ACC	Air Combat Command
ACM	asbestos-containing materials
ADEQ	Arizona Department of Environmental Quality
AESA	active electronically scanned array
AETC	Air Education and Training Command
AFAF	Air Force Auxiliary Field
AFB	Air Force Base
AFI	Air Force Instruction
AFM	Air Force Manual
AFOSH	Air Force Occupational and Environmental Safety, Fire Protection and Health
AFRC	Air Force Reserve Command
AFSOC	Air Force Special Operations Command
AGE	aerospace ground equipment
AGL	above ground level
AGS	Air Guard Station
AHAS	Avian Hazard Advisory System
AIA	Airport Influence Area
AICUZ	Air Installation Compatibility Use Zone
Air Force	U.S. Air Force
ANG	Air National Guard
ANSI	American National Standards Institute
APE	area of potential effect
APS	Arizona Public Service
APZ	Accident Potential Zone
AQB	Air Quality Bureau
AQD	Air Quality Department
AQRV	air quality related values
ARC	Airport Reference Code
Army	U.S. Army
ARS	*Arizona Revised Statutes*
ARTCC	Air Route Traffic Control Center
AS	Airlift Squadron
ASA	Acoustical Society of America
ASU	Airspace for Special Use
ATA	air traffic area
ATC	air traffic control
ATCAA	Air Traffic Control Assigned Airspace
ATCT	Air Traffic Control Tower
AT/FP	Anti-Terrorism/Force Protection
ATRC	automatic target recognition and classification
Aux-1	Luke AFB Auxiliary Airfield 1
AZGFD	Arizona Game and Fish Department
AZPDES	Arizona Pollutant Discharge Elimination System
B Course	Basic Initial Qualification Training
BAI	Backup Aircraft Inventory
BAM	Bird Avoidance Model
BASH	Bird/Wildlife–Aircraft Strike Hazard
BAWA	Bosque del Apache Wilderness Area
BDM	Basing Decision Memorandum
BDU	Bomb Dummy Units
BHWG	Bird Hazard Working Group
BLM	U.S. Bureau of Land Management
BMGR	Barry M. Goldwater Range
BMP	Best Management Practice
BRAC	Base Realignment and Closure
BWWSA	Boles Wells Water System Annex
CAA	Clean Air Act
CAB	Combat Aviation Brigade
CAP	Central Accumulation Point
CAS	Close Air Support
CCF	hundreds of cubic feet
CDNL	C-weighted day–night average sound level
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CFPO	cactus ferruginous pygmyowl
CFR	*Code of Federal Regulations*
CO	carbon monoxide
CTOL	Conventional Takeoff and Landing
CV	Carrier Variant
CWA	Clean Water Act
CY	calendar year
CZ	Clear Zone
dB	decibel
DDESB	Department of Defense Explosives Safety Board
DEQ	Department of Environmental Quality
DNL	day–night average sound level
DNL_{mr}	onset rate-adjusted day–night average sound level
DoD	U.S. Department of Defense
DPS	Distinct Population Segment
EA	Environmental Assessment
EIS	Environmental Impact Statement

EO	Executive Order
EOD	Explosive Ordnance Disposal
EOTS	electro-optical targeting system
EPA	U.S. Environmental Protection Agency
EPIA	El Paso International Airport
ERP	Environmental Restoration Program
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity Distance
EWL	Enterprise Wide Look
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FEMA	Federal Emergency Management Agency
FES	Fire Emergency Services
FICAN	Federal Interagency Committee on Aircraft Noise
FICUN	Federal Interagency Committee on Urban Noise
FIP	Federal Implementation Plan
FL	Flight Level
FLIR	forward-looking infrared
FMS	Foreign Military Sales
FS	Fighter Squadron
FTU	Formal Training Unit
FW	Fighter Wing
FY	fiscal year
GAF	German Air Force
GBU	Guided Bomb Unit
GCRMC	Gerald Champion Regional Medical Center
GHG	greenhouse gas
GIS	geographic information system
GOV	government-owned vehicle
GPS	global positioning system
GWETRS	Groundwater Extraction, Treatment, and Recharge System
GWP	global warming potential
HAZMART	hazardous materials pharmacy
I-84	Interstate 84
IAP	Initial Accumulation Point
IC	Instruction Course
ICRMP	Integrated Cultural Resources Management Plan
IDANG	Idaho Air National Guard
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IFR	Instrument Flight Rules
IICEP	Interagency/Intergovernmental Coordination for Environmental Planning
IJTS	Initial Joint Training Site
ILS	Instrument Landing System
IMPLAN	Impact Analysis for Planning
INM	Integrated Noise Model
INRMP	Integrated Natural Resources Management Plan
IP	Instructor Pilot
IR	Instrument Route
IRP	Installation Restoration Program
IRST	infrared search and track
ITC	integrated training center
JDAM	Joint Direct Attack Munition
JLUS	Joint Land Use Study
JROC	Joint Requirements Oversight Council
JSF	Joint Strike Fighter
JSFPO	Joint Strike Fighter Program Office
JTX	Joint Training Exercises
JWA	Jarbidge Wilderness Area
L_{eq}	equivalent sound level
$L_{eq(SD)}$	school day equivalent sound level
L_{max}	maximum noise level
LBP	lead-based paint
LEED	Leadership in Energy and Environmental Design
MAG	Maricopa Association of Governments
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MG	Medical Group
MGD	million gallons per day
MHRC	Mountain Home Range Complex
MJU	Mobile Jettison Unit
MMRP	Military Munitions Response Program
MOA	Military Operations Area
MOUT	Military Operations in Urban Terrain
MR_NMAP	MOA-Range NOISEMAP
MSA	Munitions Storage Area
MSD	Municipal School District
MSL	mean sea level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NCP	Noise Compatibility Program
NEPA	National Environmental Policy Act
NEXRAD	Next Generation Radar
NHPA	National Historic Preservation Act
NIOSH	National Institute of Occupational Safety and Health
NIPTS	Noise-Induced Permanent Threshold Shift
NLR	noise level reduction
NM	nautical mile

NMAAQS	New Mexico Ambient Air Quality Standards
NMDGF	New Mexico Department of Game and Fish
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOI	Notice of Intent
NOTAM	Notice to Airmen
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NRIS	National Register Information System
NWR	National Wildlife Refuge
O_3	ozone
OCFFA	Otero County Fire Fighters Association
OFA	Object-Free Area
OFZ	Obstacle Free Zone
OSHA	Occupational Safety and Health Administration
OWS	oil–water separator
PAA	Primary Aircraft Authorized
PAG	Pima Association of Governments
PAPI	precision approach path indicator
PAR	Precision Approach Radar
PDEQ	Pima County Department of Environmental Quality
PEM	Porous European Mix
PHL	potential hearing loss
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
POV	personally owned vehicle
ppm	parts per million
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
psig	pounds per square inch gauge
PTC	Pilot Training Center
PVC	polyvinyl chloride
PW	Pratt and Whitney
Q-D	quantity-distance
RAPCON	Radar Approach Control Facility
RIAC	Roswell International Air Center
RNAV	Radar Navigation
ROD	Record of Decision
ROI	region of influence
RPA	remotely piloted aircraft
RPZ	Runway Protection Zone
RSA	Runway Safety Area
SAGE	Semi-Automatic Ground Environment
SATR	Special Air Traffic Rule
SB-ESG	Strategic Basing Executive Steering Group
SDD	system development and demonstration
SEL	sound exposure level
SEL_r	onset rate-adjusted sound exposure level
SFO	simulated flameout
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SM	statute mile
SO_2	sulfur dioxide
SOC	Senior Officer Course
SRMA	Special Recreational Management Area
STOVL	Short Takeoff and Vertical Landing
SUA	Special Use Airspace
SULMA	Special Use Land Management Area
SWFL	southwestern willow fly catcher
SWPPP	Storm Water Pollution Prevention Plan
TAA	Tucson Airport Authority
TAAFD	Tucson Airport Authority Fire Department
TAC	Tactical
TACAN	Tactical Air Navigation
TCE	trichloroethene
TCP	traditional cultural property
THPO	Tribal Historic Preservation Office
TIAA	Tucson International Airport Area
TNT	trinitrotoluene
TP	Target Practice
TRACON	Terminal Radar Approach Control
TUS	Tucson International Airport
TX Course	Transition/Conversion/Refresher/ Requalification Training
UAE	United Arab Emirates
UAS	unmanned aircraft system
UFC	Unified Facilities Criteria
U.S.C.	*United States Code*
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USMC	U.S. Marine Corps
USN	U.S. Navy
UTTR	Utah Test and Training Range
VCP	vitrified clay pipe
VFR	Visual Flight Rules
VOC	volatile organic compound
VOR	VHF Omni-Directional Radio Range
VORTAC	VHF Omni-Directional Radio Range Tactical Air Navigation Aid

VR	Visual Route
WG	Wing
WHSA	White Sands National Monument
WRCC	Western Regional Climate Center
WSA	wilderness study area
WSMR	White Sands Missile Range
WSR	Wild and Scenic River
WWTP	wastewater treatment plant

Preface

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Preface

This *Final F–35A Training Basing Environmental Impact Statement (F-35A Training EIS)* provides an analysis of the U.S. Air Force (Air Force) proposal to base a Pilot Training Center (PTC) with the beddown of F-35A training aircraft at one or more existing Air Force or Air National Guard bases. The Air Force Air Education and Training Command (AETC) is responsible to provide F-35A aircrews the training and skills needed to fully prepare for combat assignments in accordance with U.S. national objectives. The Federal Aviation Administration and the U.S. Marine Corps (USMC) are cooperating agencies, as defined in Title 40 of the *Code of Federal Regulations*, Section 1508.5. A cooperating agency is any Federal agency other than a lead agency, which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal. The environmental impact analysis process to assess the beddown of training aircraft is designed to:

- Provide environmental information to allow decisionmakers the flexibility to make informed decisions dealing with F-35A training aircraft at one or more alternative candidate basing locations.
- Ensure that the public and agencies are involved in the process and fully informed about the beddown's effect on the natural and human environment.

The F-35A is a fifth-generation, single-seat, single-engine, low-observable military fighter with extensive electronic warfare capabilities. The F-35A has a single engine that can produce in excess of 40,000 pounds of thrust and features internal weapons bays to reduce the aircraft radar signature. The F-35A also has external attachments for mission-specific external fuel or munitions. Pilots need to be trained in the highest level of warfighter capability to apply the F-35A's diverse and complex capabilities. These capabilities include deploying a variety of air-to-air and air-to-surface munitions, executing electronic warfare and air defense missions, and performing Close Air Support. Training pilots and aircraft require ranges and existing military airspace to achieve proficiency in all of the F-35A's capabilities.

Guide to This Document

This *F-35A Training EIS* is designed to provide a reader-friendly document that describes the baseline conditions and environmental consequences of F-35A training aircraft alternative beddown locations, facilities, ranges, and airspace to support training aircraft. This Final Environmental Impact Statement (EIS) contains four chapters, appendices, a glossary, and an acronym and abbreviation list. This preface provides an overview of the EIS chapters and the EIS process.

Alternatives refer to the candidate base locations. Scenarios refer to the numbers of aircraft that could be bedded down at any of the alternative bases.

Chapter 1 presents the purpose and need to base F-35A training aircraft and explains the background for meeting the purpose and need. Training locations would be selected to maintain the highest level of pilot training for required F-35A assignments.

Chapter 2 describes the Proposed Action and alternatives at Boise Air Terminal Airport Air Guard Station (Boise AGS), Holloman Air Force

Base (Holloman AFB), Luke Air Force Base (Luke AFB), and Tucson International Airport Air Guard Station (Tucson AGS) to base up to 144 F-35A aircraft. Chapter 2 describes the Air Force's strategy for basing the F-35A and associated pilot training. The evaluation of F-35A pilot training encompasses personnel and facility needs, airspace and range needs, and mission requirements. Chapter 2 also presents a summary of comments received and the EIS sections where the issues are addressed to facilitate public and agency review of the EIS.

Chapter 2 concludes with a summary comparison of the environmental consequences of establishing training aircraft at the alternative base locations. The Chapter 2 comparison of environmental effects is drawn from the base-specific analyses in Chapter 4 of this EIS. The comparison takes into consideration the environmental features of each alternative location and associated airspace and range use and directs readers to the EIS sections that address the environmental features. Readers who wish to quickly review the document and compare the alternative locations will benefit from Table 2–12, the summary comparison table found at the end of Chapter 2.

Chapter 3 describes the environmental resources being considered in this EIS, including the applicable regulations, permits, and appropriate agencies involved in the determination of environmental consequences. Chapter 3 also describes the methodology followed for each environmental resource to evaluate the environmental consequences of the basing of the F-35A training aircraft. The methodology applied to each environmental resource is the same across all candidate bases.

Base-Specific Sections

Each alternative base under consideration is presented in a base-specific section in Chapter 4 of this EIS. Each alternative base has a corresponding code, e.g., BO for Boise AGS. Section 1.0 within each base-specific section of Chapter 4, e.g., BO 1.0 for Boise AGS, summarizes the F-35A training requirements at that base. Section 2.0 details manpower facilities at the base, range missions, and airspace usage from that base. Section 3.0 presents base-specific environmental baseline conditions for the base and airspace and the environmental consequences by environmental resource for the base and airspace. A set of beddown scenarios is described in Section 2.0 for each alternative base. The No Action Alternative would not select a base for training F-35A aircraft at this time.

Each base-specific Section 3.0 is organized by a consistent set of environmental resources identified as important during public scoping. Readers who have read the overall Chapters 1 and 2 following this Preface and are interested in a specific base can consult the specific base section to review the analysis for that base and its associated airspace. Section 4.0 discusses cumulative projects for the base and associated airspace.

This EIS contains references and the list of preparers. Appendices provide detailed background data for the analysis. For your convenience, a glossary and a list of acronyms and abbreviations are provided.

Attention to Public Comments

This *F-35A Training EIS* has undergone an extensive public review. The scoping period had 23 scoping meetings in three states. Public hearings on the Draft EIS were held at 13 locations in those states.

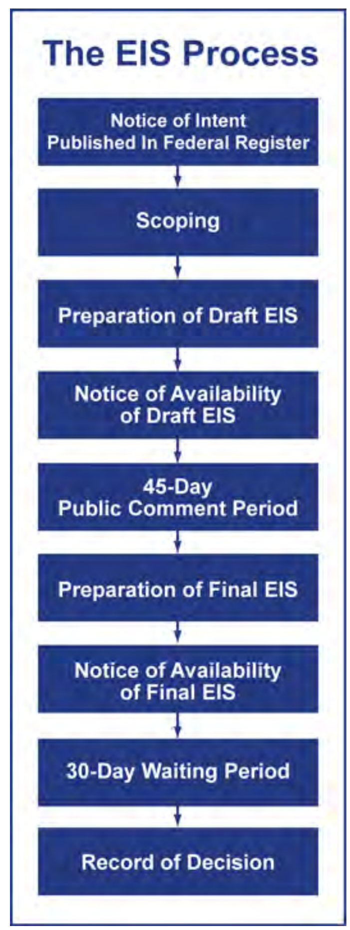
The environmental analysis in this EIS focuses on the issues raised during the public and agency scoping period and addresses comments raised during the public review of the Draft EIS.

The primary issues identified during scoping have been summarized throughout this EIS. Comments raised during the public review of the Draft EIS are included in Appendix D. This attention to public comments helps focus the EIS and is designed to help the decisionmakers understand items of interest to the public and agencies.

The National Environmental Policy Act (NEPA) Process

This *Final F-35A Training EIS* has been prepared in accordance with NEPA (42 *United States Code* [U.S.C.] 4321 et seq.), Council on Environmental Quality regulations (40 CFR 1500–1508), and *The Environmental Impact Analysis Process* (Air Force Instruction [AFI] 32-7061 (Air Force 2003), as promulgated in 32 CFR 989 et seq.). NEPA is the basic national charter for identifying environmental consequences of major Federal actions. NEPA ensures that environmental information is available to the public, agencies, and the decisionmakers before decisions are made and before actions are taken.

This Final EIS was prepared as a tool for compiling information about the proposed basing of a PTC and the beddown of F-35A training aircraft and providing a full and fair discussion of environmental impacts on the natural and human environment. Reasonable alternatives to the Proposed Action are evaluated in this Final EIS. In this Final EIS, the No Action Alternative means that no decision to base F-35A training aircraft would be made at this time. The No Action Alternative constitutes the baseline conditions at each alternative location. Alternatives were analyzed to ensure that fully informed decisions are made after review of the comprehensive, multidisciplinary analysis of potential environmental consequences. Compliance with NEPA guidance for preparation of an EIS involves several critical steps depicted in the flowchart entitled, "The EIS Process," and summarized below.



1. *Announce that an EIS will be prepared*. For this *F-35A Training EIS*, a Notice of Intent was published in the *Federal Register* on December 28, 2009.

2. *Conduct scoping*. This was the first major step to identify the relevant issues to be analyzed in depth and to eliminate issues that are not relevant. Scoping for this *F-35A Training EIS* ran from January 25, 2010, through May 17, 2010. Within that period, the Air Force actively solicited comments from the public, local governments, Federal and state agencies, and environmental groups to make sure their concerns and comments about the proposed beddown were included in the analyses. In January–February 2010, the Air Force initiated the Interagency/Intergovernmental Coordination for Environmental Planning (IICEP) and submitted letters to local, state, tribal, and Federal agencies informing them of the Air Force's intent to prepare this EIS (see Appendix A). The Air Force held scoping meetings near the alternative basing locations and in the vicinity of the associated military airspace. The purpose of these meetings was to provide the public an opportunity to learn about the proposal and solicit public and agency inputs for the EIS analysis. Approximately 1,800 members of the public and agency representatives signed in at the 23 scoping meetings. In addition to receiving oral and written comments at the scoping meetings, the Air Force also received written

comments through the mail from the public and agencies. To the extent possible, scoping comments were used to shape the analysis and focus the issues in the EIS. The Air Force has completed government-to-government consultations with potentially affected Native American tribes by requesting affected tribes to identify concerns related to the alternatives (see Appendix C).

3. *Prepare a Draft EIS*. The Draft EIS is a comprehensive document for public and agency review. The Draft EIS presents the existing conditions for the four alternative locations and provides analysis of the environmental consequences of the F-35A aircraft scenarios that would potentially be located at the alternative locations. To ensure the widest dissemination possible, the Draft EIS was distributed to agencies, numerous libraries, and members of the public that requested copies. The Draft EIS is available at http://www.f-35atrainingeis.com/website. The public comment period began when the Notice of Availability (NOA) for the Draft EIS was published in the *Federal Register* on January 20, 2012.

4. *Public/agency review.* The Draft EIS public comment period provided the public and agencies, including Native American tribal governments, the opportunity to review the Draft EIS and to submit comments on the analysis. This comment opportunity included a series of public hearings held during the comment period. The hearings gave the public and agencies an opportunity to orally comment on the Draft EIS after their review and evaluation of the document. The hearings provided direct feedback to the Air Force from the public and agencies. All comments received during the public comment period and all oral comments from the public hearings are incorporated into this Final EIS. Oral and written comments submitted at public hearings and those received through the mail by the Air Force were given equal consideration in the preparation of this Final EIS.

5. *Prepare a Final EIS.* This Final EIS was prepared following the public comment period and includes all written comments submitted during the public comment period or presented at public hearings that address matters within the scope of the EIS. This Final EIS revises the Draft EIS to reflect public and agency comments, the Air Force's responses, and additional information received from reviewers (refer to Appendix D). This Final EIS provides the decisionmakers with a comprehensive review of the potential environmental consequences of selecting basing locations for F-35A training aircraft. An NOA is published in the *Federal Register* to announce availability of this Final EIS.

6. *Issue a Record of Decision (ROD).* The final step in the NEPA process is approval of the ROD. After the NOA is published, there is a 30-day waiting period before the ROD may be signed. The ROD identifies which location or locations have been selected by the Air Force decisionmakers, how many F-35A aircraft would be bedded down at the selected location or locations, and what management actions or mitigation measures would be carried out to reduce, where possible, adverse impacts on the environment. The ROD specifies the entities responsible for implementing mitigations, the timing of any mitigations, and the source of funds to implement any mitigations.

A Focus on Environmental Resources

NEPA requires focused analyses on the areas and resources, such as biological and cultural resources or socioeconomics, that could potentially be affected by the Proposed Action or an alternative. An EIS should emphasize those resources affected by the Proposed Action and exclude discussion of resources not affected. In so doing, an EIS should not be encyclopedic. These overarching NEPA principles guided the focus on environmental resources in this EIS. To define the affected area and environmental resources, the Air Force:

- identified the four alternative locations for bedding down, or basing, F-35A training aircraft;
- identified scenarios of facilities and locations of all elements involved in squadron-equivalent numbers of F-35A training aircraft at each alternative basing location;
- correlated the environmental issues raised in scoping with the potentially affected locations and environmental resources;
- determined the possible interaction of these project elements with the environmental resources at potentially affected locations;
- assessed whether, how, and to what degree environmental resources may be affected; and
- identified specific management actions and mitigations to reduce, where possible, impacts on environmental resources.

The affected locations and affected resources compose the affected environment for the four candidate basing alternatives.

Table P–1 presents the 15 environmental resource categories evaluated in this EIS for each alternative base. The numbers in the first column are EIS sections that address these resources in each base-specific evaluation. In addition, this EIS evaluates base-specific cumulative consequences and the irreversible commitment of resources in each base-specific Section 4.0 within Chapter 4.

The affected environment for 11 of the 15 resource categories includes the alternative base environs, associated ranges, and areas under each associated airspace. For 4 of the resources, the affected environment includes only the base environs because no element of the proposal would affect these resources under the airspace or range. Flight training by the F-35A would not interact with transportation resources under training airspace. No construction or development is proposed on the ranges or under the airspace, so no impacts on soils and water resources, infrastructure, or hazardous materials and waste would occur under the airspace.

Table P–1. Resources Focused on in the Environmental Impact Analysis Process

Base-Specific Section (within Chapter 4)	*Environmental Resource*	*Boise AGS*		*Holloman AFB*		*Luke AFB*		*Tucson AGS*	
		Base	**Airspace and Range**	**Base**	**Airspace and Range**	**Base**	**Airspace and Range**	**Base**	**Airspace and Range**
3.1	Airspace Management and Use	Yes[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2	Noise	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.3	Air Quality	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.4	Safety	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.5	Soils and Water	Yes	No[2]	Yes	No	Yes	No	Yes	No
3.6	Terrestrial Communities	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.7	Wetlands and Aquatic Communities	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.8	Threatened, Endangered, and Special Status Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.9	Cultural Resources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.10	Land Use and Recreation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.11	Socioeconomics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.12	Environmental Justice and Protection of Children	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.13	Infrastructure	Yes	No	Yes	No	Yes	No	Yes	No
3.14	Transportation	Yes	No	Yes	No	Yes	No	Yes	No
3.15	Hazardous Materials and Waste	Yes	No	Yes	No	Yes	No	Yes	No

[1] Yes The affected environment section discusses both the base environs and the areas under the associated airspace.

[2] No The affected environment section does not discuss the areas under the associated airspace because no element of the proposal would result in impacts on these resources under the airspace or ranges.

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Chapter 1

How to Use This Document

Our goal is to give you a reader-friendly document that provides an in-depth, accurate analysis of the Proposed Action, the alternative beddown locations, and the potential environmental consequences for each base. The organization of this Final Environmental Impact Statement (Final EIS) is shown below.

Overall Proposal

Table of Contents, List of Figures, List of Tables, and Acronyms and Abbreviations

Preface: Detailed Guide for Reading the EIS → The Preface provides a detailed guide for reading the EIS.

Chapter 1: Purpose and Need for F-35A Training Basing → Chapter 1 explains the decision made by Congress to provide the U.S. Air Force with a next-generation fighter. Also described are the features of the F-35A, how the F-35A will be based, and how aircrews will train for their operational assignments.

Chapter 2:
- Overview of Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of Proposed Action and Alternatives

→ Chapter 2 provides an overview of the Proposed Action and alternatives, which is to beddown the F-35A at Boise AGS, Holloman AFB, Luke AFB, and/or Tucson AGS.

Chapter 3: Resource Definition and Methodology for Analysis → Chapter 3 defines the environmental resources that could potentially be affected by the Proposed Action and explains the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base Specific Information

Boise AGS	Holloman AFB	Luke AFB	Tucson AGS
Section BO 1.0 Alternative Overview	**Section HO 1.0** Alternative Overview	**Section LU 1.0** Alternative Overview	**Section TU 1.0** Alternative Overview
Section BO 2.0 Base-Specific Project Details	**Section HO 2.0** Base-Specific Project Details	**Section LU 2.0** Base-Specific Project Details	**Section TU 2.0** Base-Specific Project Details
Section BO 3.0 Affected Environment and Environmental Consequences	**Section HO 3.0** Affected Environment and Environmental Consequences	**Section LU 3.0** Affected Environment and Environmental Consequences	**Section TU 3.0** Affected Environment and Environmental Consequences
Section BO 4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section HO 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section LU 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section TU 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources

Overall Proposal

References	List of Preparers	Index	List of Repositories	Glossary	Appendices A, B, and C
Volume 1	Volume 1	Volume 1	Volume 1	Volume 1	Volume 2

DEIS Comments

Appendix D, D.1, D.2, and D.3	Appendix D, D.4 and D.5	Appendix D, D.6, D.7, D.8, and D.9	Appendix D, D.10
Receipt and Locating Comments	Alphabetical Directory	Copies of Letters and Transcripts	Response to Comments
Volume 2	Volume 2	Volume 2	Volume 2

Chapter 1. Purpose and Need for F-35A Training Basing

1.1 Introduction

The Joint Strike Fighter (JSF) Program is a joint, multinational program among the U.S. Air Force (Air Force), U.S. Navy (USN), U.S. Marine Corps (USMC) and eight cooperative international partners: the United Kingdom, Italy, the Netherlands, Turkey, Canada, Australia, Denmark, and Norway. The JSF Program's objective is to develop and deploy a three-variant family of highly common and affordable strike fighter aircraft to meet the operational needs of the Air Force, USN, USMC, and international partners. The JSF has been officially named the F-35 Lightning II, three variants of which are the F-35A, F-35B, and F-35C.

The F-35A variant of the JSF Program is the next-generation Conventional Takeoff and Landing (CTOL) multi-role fighter aircraft for the Air Force and will replace and supplement the Air Force's F-16 and A-10 tactical fighter aircraft. The F-35A is intended to be the Air Force's premier strike aircraft through 2040. Operational specifications required it to be more effective than existing fighters in air-to-ground combat, air-to-air combat, reconnaissance, and suppression of air defenses and to have a better range while requiring less logistics support. The F-35B is the Short Takeoff and Vertical Landing (STOVL) variant to be used by the USMC, and the F-35C is the Carrier Variant (CV) to be used by the USN. Neither the F-35B nor the F-35C is being considered for the alternatives evaluated in this Environmental Impact Statement (EIS).

Throughout the planning process to base an F-35A Pilot Training Center, it has become apparent that there may be various uncertainties until the operations can be learned and tested over time. Consequently, the Air Force will accommodate growth in understanding F-35A training activities by incorporating an adaptive management approach to the on-going basing of the F-35A aircraft and the training of people to fly and maintain it.

The life of the weapons system procurement is expected to stretch over a 30-year period between 2010 and 2040. During that time, the current estimate for the total number of F-35A variant aircraft to be acquired by the Air Force, international partners, and through Foreign Military Sales (FMS) is in excess of 2,500. As aircraft are produced, they will be assigned to various roles, as needed. A very small number will be assigned to the roles of Test and Force Development. These test roles are quite important during System Development and Demonstration, but continue throughout the life of the weapons system for operational enhancement. The majority of the aircraft will be assigned to operational combat units that are required to maintain stipulated levels of combat readiness. Supporting the total force structure are a number of aircraft assigned to training units that focus upon the need to provide and sustain the necessary number of trained and qualified personnel.

This *F-35A Training Basing Environmental Impact Statement (F-35A Training EIS)* addresses four alternative bases for the beddown of the number of F-35A training aircraft projected to be delivered beginning in fiscal year (FY) 2013.

1.2 Purpose of Training Basing

The purpose of the Proposed Action is to efficiently and effectively provide formal training that supplies qualified aircrew for the Air Force.

1.3 Need for Training Basing

The need for the Proposed Action is to support aircrew formal training requirements associated with the F-35A. The F-35A is the fifth-generation fighter replacement for aging F-16 and A-10 aircraft scheduled to be withdrawn from service around 2025.

F-35A warfighting missions can only be accomplished by properly trained pilots and personnel with adequate base facilities, military airspace, and military ground ranges to support the training. This EIS supports decisionmaking and evaluates the potential environmental effects of bedding down sufficient F-35A aircraft to meet the overall goals and objectives of providing qualified F-35A pilots. Trained F-35A pilots and personnel must be available to meet F-35A scheduled delivery dates as current training legacy fighter aircraft are withdrawn from the inventory.

1.4 Background for Meeting the Purpose and Need

On October 26, 2001, Under Secretary of Defense for Acquisition, Technology and Logistics, Edward C. "Pete" Aldridge, Jr., announced the decision to proceed with the JSF Program. Since that time, the program has progressed and is currently in System Development and Demonstration and Low-Rate Initial Production.

An important part of any military weapons system is sustaining a required number of trained personnel at a required level of expertise. For a new weapons system such as the F-35A, the fielding plan must include establishing the training force early in the program. The training organizations play an important role in producing and sustaining the required number of qualified personnel to operate and support the weapons system. All pilots selected for training with the F-35A must meet the following minimum qualifications: graduate of Air Force pilot training program, or graduate of other U.S. military pilot training if ordered by the Air Force, or graduate of other U.S. military pilot training if equivalent to Air Force program and at least 400 hours primary and instrument flight time (Air Force 2010a). Based upon the Air Force's planned purchase of 1,763 F-35A CTOL aircraft (the only version the Air Force is acquiring), 11 F-35A training squadrons, each with 24 aircraft, is the estimated requirement to sustain Air Force pilot training production. In addition, the Air Force is expected to plan for support of U.S. Department of Defense (DoD) training agreements for both the international partner and potential FMS countries. Current estimates predict that the Air Force might have to plan for up to two training squadron's equivalent for international partners and up to two training squadron's or more equivalent for FMS. Therefore, the total training requirement for the Air Force could necessitate that up to 15 or more F-35A training squadrons be established during the potential 30-year acquisition program.

1.4.1 Selection of Candidate Pilot Training Center Base Locations

This *F-35A Training EIS* evaluates four alternatives with scenarios of up to 144 aircraft in 24-aircraft increments. With basing for the ITC established, the Air Force needed to begin basing action for a Pilot Training Center (PTC) to support requisite training production. During 2009, the Air Force performed an enterprise-wide evaluation of more than 200 potential locations to identify and quantify which could be considered locations for bedding down the F-35A fifth-generation fighter aircraft. The basing criteria applied to possible locations to identify candidate training F-35A basing locations for this *F-35A Training EIS* were approved by the Secretary and Chief of Staff of the Air Force. The basing criteria were airspace, flight training ranges, weather, support, facilities, runways, taxi ramps, environmental concerns, and cost factors. The preliminary results of this enterprise-wide evaluation were refined by the Air Force's Strategic Basing Executive Steering Group (SB-ESG).

The SB-ESG reviewed the preliminary results, screened locations, and considered military judgment factors consisting of strategic plans and guidance, global posture, building international partnerships, Air Guard and Reserve integration, aircraft beddown timing, force structure, training requirements and efficiencies, logistic supportability, and resourcing and budgeting. The SB-ESG prepared a list of screened and reviewed locations to the Secretary and Chief of Staff of the Air Force to identify alternative F-35A candidate bases.

The Air Force developed scenarios to address squadron-equivalent numbers of F-35A aircraft and associated base facility needs for each candidate location. On July 29, 2010, the Secretary of the Air Force identified the Air Force's preferred alternative for training and operational wing basing locations. The identification of a preferred alternative is consistent with Council on Environmental Quality guidance (40 *Code of Federal Regulations* [CFR] 1502.14(e)). Figure 1–1 provides an overview of the candidate base selection process. The outcome of this enterprise-wide and SB-ESG F-35A aircraft process identified the candidate bases for F-35A training aircraft to support the initial delivery of the F-35A aircraft. This *F-35A Training EIS* evaluates four alternatives with scenarios of up to 144 aircraft in 24-aircraft increments.

1.5 Background of the F-35A

The Air Force designated the F-35A to replace and supplement existing F-16 and A-10 fleets and to complement the F-22. In this regard, the new F-35A aircraft would fulfill the wide range of roles and missions conducted by F-16s and A-10s. As such, the Air Force CTOL F-35A embodies critical combat capabilities to fulfill multiple mission roles, with an emphasis on air-to-ground missions. The F-35A epitomizes the characteristics needed for this multiple-mission role, offering a unique combination of capabilities, as follows:

- *Low Observability:* Design features and radar-absorbent composite materials make the F-35A harder to detect than conventional aircraft of similar size.
- *Range and Supersonic Speed:* The F-35A offers an equivalent or greater combat radius than the legacy F-16 while performing at substantially higher speeds than the legacy A-10. The speed and lower observability make Air Force pilots less vulnerable to enemy aircraft and ground-based threats.

- *Sensor Integration to Support Precision Munitions:* New F-35A computer systems, combined with an internal munitions bay, permit Air Force pilots to detect enemy threats and deliver precision munitions at substantially greater distances than possible with legacy aircraft.
- *Comprehensive Combat Information Systems:* Highly sophisticated avionics systems, including a helmet-mounted display, are integrated throughout the F-35A to provide the pilot information from many sources and produce a clear, easily understood picture of the combat situation.
- *Low Maintenance Costs:* Computerized self-tests of all systems, improved stealth maintenance, and other self-managed logistics information system components are designed to enhance the reliability and mission-readiness of the F-35A.

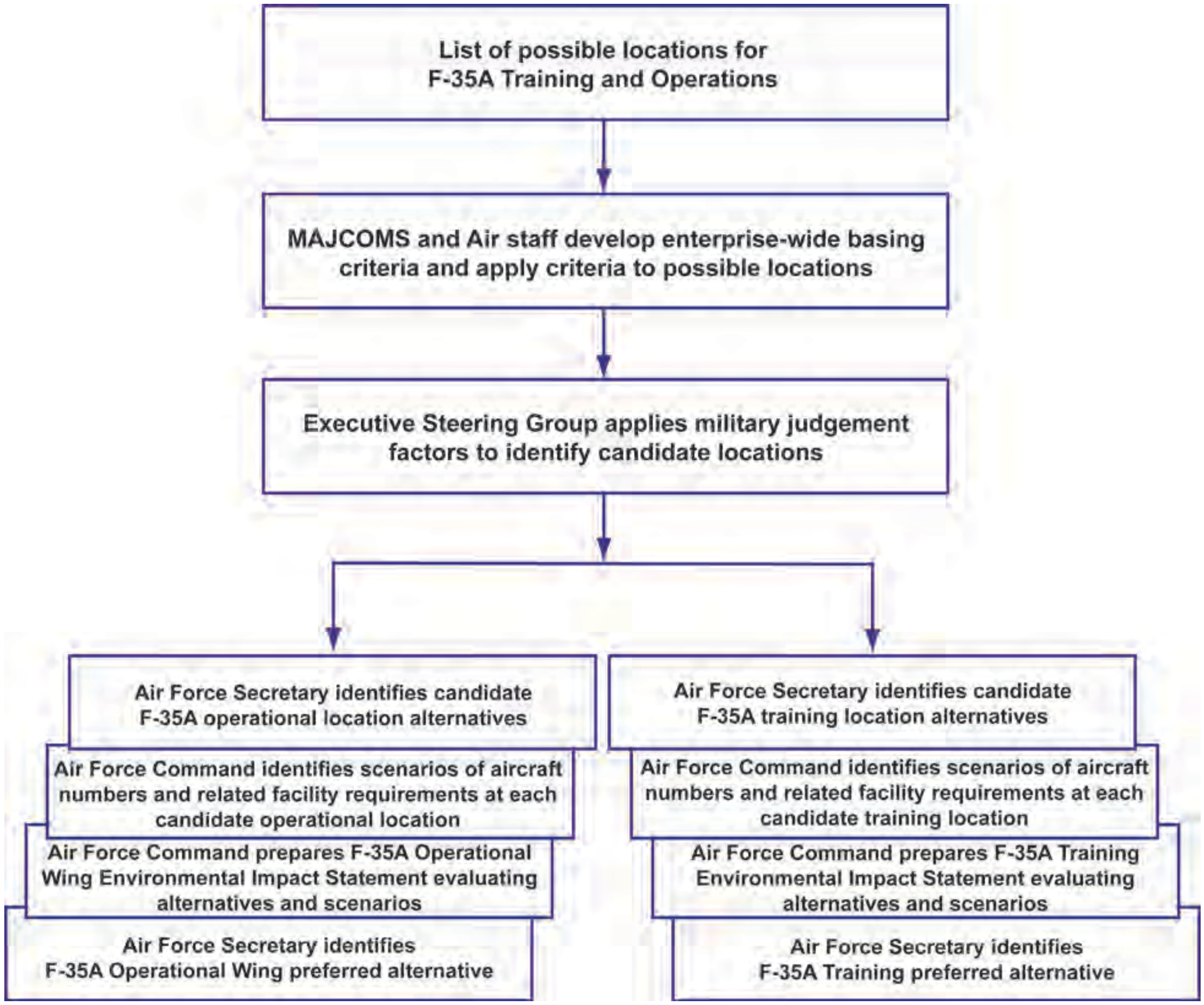

Figure 1–1. Relationship of F-35A Candidate Basing Locations to Training and Operational Environmental Impact Statements

1.5.1 Aircraft Characteristics of the F-35A

The F-35A Lightning II is a single-seat Mach 1.5 all-weather fighter, powered by one jet engine in the 40,000 pounds of thrust class. The F-35A provides survivability and lethality over existing legacy fighters and is designed to provide air-to-air and air-to-ground combat performance using low observability to avoid detection while employing a powerful sensor package to locate, target, and destroy multiple adversary ground targets and/or fighter aircraft.


The F-35A combines internal weapon bays and expanded fuel capacity to permit low-visibility penetration of enemy air defenses.

The F-35A combines supersonic speed, the ability to carry weapons internally, and turning agility of up to nine G's (nine times the force of gravity). The F-35A will provide close-in or long-range air-to-ground and air-to-air combat capability to supplement the F-22 Raptor air dominance mission.

The F-35A is approximately 51 feet long, 35 feet across the wings, and 15 feet tall. Internal fuel capacity is 9 tons, providing an unrefueled range of 1,200 miles without external tanks. The F-35A carries an internal 25-millimeter Airborne Gun Unit-22/A (GAU-22/A) cannon. The standard internal weapons load is two Air Intercept Missile-120C (AIM-120C) air-to-air missiles and two 2,000-pound Guided Bomb Unit-31 (GBU-31) Joint Direct Attack Munition (JDAM) guided bombs. Optional internal loads include eight 500-pound GBU-38 JDAM-guided bombs and a wide variety of air-to-ground missiles, dispensers, and guided weapons. The internal weapons bay is reconfigurable for all air-to-ground ordnance, all air-to-air ordnance, or a blend of both. When low observability is not required to execute a mission, the external pylons can be loaded with ordnance, yielding a weapons payload of more than 18,000 pounds.

The F-35A contains an integrated core processor that combines information from all the aircraft's sensors into a single, coordinated view of the battlefield. Among these sensors is an active electronically scanned array (AESA) radar with a synthetic aperture radar mapping mode to provide the pilot with far more precise search and targeting capabilities than exist in legacy fighters. The F-35A is also equipped with an infrared search and track (IRST) system for air-to-air combat, while advanced air-to-ground combat features include an electro-optical targeting system (EOTS) with a forward-looking infrared (FLIR) imager, a targeting laser, a laser spot tracker, and a charge-coupled device (CCD) camera. The F-35A's software is capable of analyzing the information these sensors provide using an automatic target recognition and classification (ATRC) system to identify specific targets. The F-35A also uses a speech recognition system that detects a pilot's spoken commands and operates various systems without the need of pressing buttons or flipping switches.

Pilot and ground crew training for the F-35A includes extensive classroom, simulator, and hands-on operation of training aircraft. The capabilities of the F-35A require substantial training for pilots and ground crews to familiarize them with all procedures required to operationally employ F-35A aircraft for the Air Force.

1.5.2 Air Worthiness

Each component of the F-35 is tested separately to ensure a safe aircraft. In addition to verifying the individual components, the systems are integrated into ground and flight test vehicles, which are rigorously tested as well. Ground tests examine strength of materials, resistance to environmental extremes and protection from enemy threats. With each flight test, systems within the aircraft monitor structural and electrical components to ensure they continue to operate properly. Concurrent with ongoing flight tests, engineers and scientists also test the F-35 systems at advanced laboratories. Additionally, all of F-35A mission systems are placed onto a modified 737 so engineers can monitor and measure in-flight performance.

On February 28, 2012, because of the rigorous testing outlined above, officials at the U.S. Air Force Aeronautical Systems Center issued a Military Flight Release (MFR or USAF Airworthiness Certification) that allows the F-35A Lightning II fighter to begin initial operations at the joint training center at Eglin AFB, Florida. The Air Force Airworthiness Certification (AFPD 62-6) establishes the requirements for airworthiness certification of Air Force aircraft and it applies to all U.S. Air Force-owned and operated aircraft including those of the Air National Guard and U.S. Air Force Reserve. The airworthiness certification verifies that the aircraft can be safely maintained and operated within its established operational parameters by pilots and maintainers (Air Force 2010b).

1.6 Environmental Impact Analysis Process

The National Environmental Policy Act (NEPA) (42 *United States Code* [U.S.C.] 4321 et seq.), Council on Environmental Quality regulations (40 CFR 1500–1508), and the Air Force's implementing regulations (32 CFR 989) require the Air Force to consider the potential environmental consequences of its Proposed Action early and concurrent with the initial project planning stages. An Environmental Impact Statement (EIS) documents the detailed study of these potential environmental consequences of the Proposed Action and cumulative impacts.

Stages of the environmental impact analysis process are provided below:

- **Notice of Intent (NOI).** A notice that announces the Air Force's intent to prepare an EIS is published in the *Federal Register* and local newspapers in the area of the Proposed Action. The NOI formally initiates the public scoping process.

- **Scoping.** This is an early and open process for determining the scope of issues and identifying the significant issues related to the Proposed Action. Federal, state, and local agencies and members of the public are encouraged to provide input. Public informational meetings are held to provide an opportunity for members of the public to become informed of and to comment on the issues that need to be addressed in the EIS.

- **Draft EIS.** The draft document analyzes the environmental consequences of the Proposed Action. It includes a description of the Proposed Action, the purpose and need for the Proposed Action, alternatives for implementing the Proposed Action, the existing environmental conditions where the Proposed Action would take place, and the environmental consequences of the Proposed Action. The Draft EIS may be supported by detailed technical studies, including noise, air quality, and socioeconomic analyses.

- **Draft EIS Notice of Availability (NOA) and Notice of Public Hearings.** A formal notice, placed in the *Federal Register* by the U.S. Environmental Protection Agency, announces that the Draft EIS is available for review by the public and Federal, state, and local agencies. The NOA announcements are also published in local newspapers.

- **Public Comment Period.** Federal, state, and local agencies and members of the public are invited to provide comments on the Draft EIS for a minimum of 45 days. Public hearings are held to provide an opportunity for members of the public to comment on the Draft EIS. Oral comments recorded by a court reporter and written comments are also accepted throughout this 45-day period.

- **Final EIS.** The Final EIS documents the comments received on the Draft EIS and includes a response to all relevant comments. Responses may include modifying or developing new alternatives to the Proposed Action; supplementing, improving, or modifying the analyses; and factual corrections.

- **Final EIS NOA.** A formal notice is placed in the *Federal Register* by the U.S. Environmental Protection Agency and advertisements are run in local newspapers to announce that the Final EIS is available for public review. The Final EIS NOA begins a 30-day waiting period before the Record of Decision (ROD) is signed.

- **ROD.** The ROD will identify which location or locations have been selected by the Air Force decisionmakers, how many F-35A aircraft would be bedded down at the selected location or locations. The ROD specifies mitigations and unavoidable adverse impacts.

The adaptive management program introduced in Section 1.0 will focus primarily on the F-35A PTC and incorporate the following kinds of adaptive management approaches:

- Noise models that have been developed or will be developed in the future will be used to reveal and understand the potential effects of policies, activities, or practices that are being considered for implementation in the F-35A aircraft ramp-up to final operation capability.

- Management and oversight activities reveal, through monitoring and evaluation of results, the accuracy or completeness of the earlier predictions. Adaptations can be developed to eliminate or reduce effects.

New knowledge and information produced through experimentation can be incorporated into management options and recommendations to appropriate decision makers. This EIS identifies and describes the affected environment and assesses the potential environmental impacts resulting from implementation of the Proposed Action for the basing of an F-35A PTC at any of the four basing alternatives, including the construction of new facilities and changes in personnel at the alternative locations. The analysis identifies environmental permits and specific mitigation measures to prevent or minimize environmental impacts, if required. Air Force environmental impact analysis process regulations require the action proponent to prepare a mitigation plan and forward it to Headquarters (HQ), U.S. Air Force for review within 90 days of the signing of the Record of Decision (ROD). Among other things, the mitigation plan must specifically identify each mitigation measure, how the measures will be

executed, and who will fund and implement the mitigations. Requiring the detailed mitigation plan after the signing of the ROD enables the mitigation plan to be tailored precisely to the decision that is made. In the analysis of anticipated impacts in the EIS, the Air Force has done its best to accurately predict potential impacts and anticipate future conditions using the best available information and tools at the time of analysis. However, given the nature of the alternatives analyzed, new information may become available, or the effectiveness of mitigation measures may be different than expected. Adaptive management techniques are well suited to such circumstances.

Since the adaptive management approach is being adopted as part of the implementation for basing an F-35A PTC, any post-ROD mitigation plan for its beddown and operations will need to include provisions for monitoring noise post implementation and the success of the mitigations, as well as procedures for making necessary adaptations.

Some adaptations may require additional NEPA analysis, such as those that would result in a substantial change to the action. Thus, the Post-ROD mitigation plan will include an adaptive management program incorporating (for example) the following kinds of adaptive management approaches:

- **Noise modeling:** Supplement existing data with new noise data as it is being developed in the future. Use new data to reveal and understand the potential effects of activities or practices that are underway or being considered for implementation in the F-35A PTC ramp up to final operational capability and thereafter. Make changes to improve mitigations and related actions.

- **Management and oversight:** Monitor and evaluate results of earlier predictions. Develop and implement adaptations to eliminate or reduce effects.

- **New knowledge and information:** Through experimentation, knowledge and information can be incorporated into management options and recommendations.

The following additional steps will also be part of the mitigation plan:

- Identifying the type of monitoring for the action and each mitigation.

- Delineating how the monitoring will be executed.

- Identifying who will fund and oversee its implementation.

- Establishing the process and responsibilities for identifying and making changes to the action or mitigations to influence beneficial results or avoid/reduce adverse ones.

Specific mitigation measures considered for the F-35A PTC at any of the alternative locations based on identified environmental impacts and public comments are discussed in Section 2.8.

1.6.1 Scoping Process

The public scoping period for this *F-35A Training EIS* began on December 28, 2009, with the initial publication of the NOI in the *Federal Register*. During the following weeks, notification letters were mailed to Federal, state, and local agencies; elected officials; nongovernmental organizations; and interested individuals. Appendix A provides a sample notification letter, the notification mailing list, and a summary of the comments and concerns received by the Air Force during the public scoping period. Newspaper advertisements announcing the intent to prepare an EIS and hold public scoping meetings were published in several local daily and weekly newspapers. These advertisements were run in the weeks preceding each of the scheduled public scoping meetings.

Twenty-three public scoping meetings were held between January 25, 2010, and April 16, 2010, in communities potentially affected by aircraft operations in New Mexico, Idaho, and Arizona. The meetings were held in an open house format where citizens could speak individually with Air Force NEPA team members. During these meetings, NEPA team members presented information on the Proposed Action through the use of display boards and fact sheets; they also answered questions posed by the public. A total of 1,829 people signed in at these meetings.

During the scoping period, which was extended to May 17, 2010, the Air Force received 1,958 written comments at the scoping meetings and through the mail. Issues and concerns included noise, impacts on property values, aircraft safety, and potential effects on the quality of life due to aircraft operations. These concerns, as well as other issues, were considered during the development of the Draft EIS. Issues specific to each of the candidate alternative locations are identified in the base-specific sections of Chapter 4. Following the scoping period, and taking the scoping comments into consideration, the Air Force prepared the Draft EIS. The NOA of the Draft EIS appeared in the *Federal Register* on January 20, 2012.

1.6.2 Public and Agency Review

The Air Force provided notification of public hearings and made the Draft EIS available to the public and agencies for review and comment through postcards, newspaper display ads, press releases, public service announcements, flyers, and letters accompanying the direct mailing of the Draft EIS. The Draft EIS was posted on a publicly available website at http://www.f35Atrainingeis.com. Copies of the Draft EIS were sent to Federal, state, and local agencies, Native American organizations, special interest groups, and citizens. The document was also sent to citizens or entities that requested a copy and was made available at libraries throughout the region of influence.

The public review and comment period for the Draft EIS took place over 54 days. During this time, the Air Force held 13 public hearings near the four alternative locations from February 7 through February 29, 2012, to provide an opportunity for the public to comment on the proposal and the analysis contained within the Draft EIS. The Air Force encouraged public and agency representatives to provide oral and written comments on the Draft EIS during the public hearings or to mail written comments on or before March 14, 2012, the close of the public comment period. Public hearing comments and all written comments received were reviewed and considered and are included in this Final EIS.

There were 2,090 people who signed in at the hearings, with 1,771 people, interest groups, and agencies providing oral or written comments during the public comment period. The Air Force also received 9,850 individual emails voicing support for Luke AFB as the training site for the F-35A.

Key consultation and coordination letters between the Air Force and the U.S. Fish and Wildlife Service (USFWS) are contained in Appendix C, including a letter from USFWS concurring with the Air Force's determination that the proposed project may affect, but is not likely to adversely affect, the Mexican spotted owl and stating USFWS's belief that the requirements of Section 7 of the Endangered Species Act have been met.

1.6.3 Government-to-Government Consultations

In an ongoing effort to identify traditional cultural resources as well as to satisfy the requirements of various laws, regulations, and Executive Orders, the Air Force consulted with Native American tribes according to the April 29, 1994, Presidential Memorandum on Government-to-Government Relations with Native American Tribal Governments, Executive Order 13175, and DoD Policy on Native American and Alaskan Native Consultation. During the scoping process described in Section 1.6.1, the Air Force submitted Interagency/Intergovernmental Coordination for Environmental Planning (IICEP) letters to tribes that reside under airspace normally used by the alternative base locations, inviting them to participate in the scoping meetings. In October and November 2010, tribes were sent letters requesting information on their concerns and initiating government-to-government consultation. Additional letters were sent in October and November 2011 to the tribes to providing further information on the Proposed Action and determining their interests in government-to-government consultation. Consultation with interested tribes was completed and additional information on the consultation process is included in Appendix C.

1.7 Lead and Cooperating Agencies

The Air Force is the proponent for the F-35A training basing proposal and is the lead agency for the preparation of this *F-35A Training EIS*. The Federal Aviation Administration (FAA) and the USMC are cooperating agencies. As defined in Title 40 of the *Code of Federal Regulations*, Section 1508.5, a cooperating agency…

> *means any Federal agency other than a lead agency which has jurisdiction by law over, or special expertise with respect to any environmental impact involved in, a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment.*

Congress has charged the FAA with administering all navigable airspace in the public interest, as necessary, to ensure the safety of aircraft and the efficient use of such airspace. The FAA is also responsible for oversight of all improvements within the airfield at airports such as Boise Air Terminal Airport and Tucson International Airport. The USMC, which is part of the USN, was invited to cooperate because both the Air Force and the USMC have responsibility for managing and scheduling a portion of training airspace and ranges (e.g., Barry M. Goldwater Range, Arizona) proposed for use in F-35A training. Appendix A presents the relevant correspondence exchanged between the FAA, the USMC, and Air Force.

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Chapter 2

How to Use This Document

Our goal is to give you a reader-friendly document that provides an in-depth, accurate analysis of the Proposed Action, the alternative beddown locations, and the potential environmental consequences for each base. The organization of this Final Environmental Impact Statement (Final EIS) is shown below.

Overall Proposal

Table of Contents, List of Figures, List of Tables, and Acronyms and Abbreviations

Preface: Detailed Guide for Reading the EIS → The Preface provides a detailed guide for reading the EIS.

Chapter 1: Purpose and Need for F-35A Training Basing → Chapter 1 explains the decision made by Congress to provide the U.S. Air Force with a next-generation fighter. Also described are the features of the F-35A, how the F-35A will be based, and how aircrews will train for their operational assignments.

Chapter 2:
- Overview of Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of Proposed Action and Alternatives

→ Chapter 2 provides an overview of the Proposed Action and alternatives, which is to beddown the F-35A at Boise AGS, Holloman AFB, Luke AFB, and/or Tucson AGS.

Chapter 3: Resource Definition and Methodology for Analysis → Chapter 3 defines the environmental resources that could potentially be affected by the Proposed Action and explains the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base Specific Information

Boise AGS	Holloman AFB	Luke AFB	Tucson AGS
Section BO 1.0 Alternative Overview	**Section HO 1.0** Alternative Overview	**Section LU 1.0** Alternative Overview	**Section TU 1.0** Alternative Overview
Section BO 2.0 Base-Specific Project Details	**Section HO 2.0** Base-Specific Project Details	**Section LU 2.0** Base-Specific Project Details	**Section TU 2.0** Base-Specific Project Details
Section BO 3.0 Affected Environment and Environmental Consequences	**Section HO 3.0** Affected Environment and Environmental Consequences	**Section LU 3.0** Affected Environment and Environmental Consequences	**Section TU 3.0** Affected Environment and Environmental Consequences
Section BO 4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section HO 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section LU 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section TU 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources

Overall Proposal

References Volume 1	**List of Preparers** Volume 1	**Index** Volume 1	**List of Repositories** Volume 1	**Glossary** Volume 1	**Appendices A, B, and C** Volume 2

DEIS Comments

Appendix D, D.1, D.2, and D.3 Receipt and Locating Comments Volume 2	**Appendix D, D.4 and D.5** Alphabetical Directory Volume 2	**Appendix D, D.6, D.7, D.8, and D.9** Copies of Letters and Transcripts Volume 2	**Appendix D, D.10** Response to Comments Volume 2

Chapter 2. Description of Proposed Action and Alternatives

2.1 Overview

This chapter presents a description of the activities and implementing actions associated with the basing of F-35A training aircraft to establish a Pilot Training Center (PTC). These activities involve the beddown and operation of the F-35A training mission, including the scheduling of designated range and regional military training airspace to accommodate operations. Construction of required training facilities involves demolition, remodeling, and construction within the confines of an installation for required facilities, infrastructure, and airfield surfaces. This section identifies training requirements that would apply to any of the alternative PTC locations. This chapter also discusses the No Action Alternative and identifies narrowing criteria used to identify candidate bases and bases that were not carried forward for analysis at this time.

The Proposed Action is to base a PTC with F-35A training aircraft to be delivered beginning in fiscal year (FY) 2013. The expectation is to beddown 72 aircraft; however, the number of F-35A aircraft available for beddown could possibly reach up to a total of 144 aircraft. This Final Environmental Impact Statement (EIS) analyzes the impacts of bedding down up to 144 aircraft at each alternative base as capacity allows. This basing will support locations where pilots of the U.S. Air Force (Air Force), international partners, and/or U.S. Foreign Military Sales (FMS) nations would be trained to safely and effectively operate fighter aircraft. Each F-35A training squadron of 24 aircraft would require personnel, facilities, and training locations to support pilot and personnel training. The Air Force has selected four alternative bases for consideration of an F-35A PTC: Boise Air Terminal Airport Air Guard Station (Boise AGS), Idaho; Holloman Air Force Base (Holloman AFB), New Mexico; Luke Air Force Base (Luke AFB), Arizona; and Tucson International Airport Air Guard Station (Tucson AGS), Arizona. Personnel, facilities, and training locations are determined based on the requirements at each candidate base to accommodate the mission. Table 2–1 provides an overview of proposed elements associated with an F-35A PTC.

Table 2–1. Overview of F-35A Training Basing Proposal

The proposal for the F-35A training basing and the beddown of F-35A aircraft would involve implementing several related elements at a selected base. These elements would occur at either a base or its associated training airspace.

Elements Affecting the Base

- ✓ Beddown up to 144 training aircraft in accordance with the aircraft delivery schedule.
- ✓ Conduct flight operations at the base for pilot training.
- ✓ Construct and manage facilities and infrastructure necessary to support an F-35A PTC.
- ✓ Implement the personnel changes (increases or decreases) at the base to conform to the PTC requirements.

Elements Affecting Airspace and Ranges

- ✓ Conduct F-35A training activities in Military Operations Areas, Military Training Routes, Air Traffic Control Assigned Airspace, and Restricted Areas associated with air-to-ground ranges emphasizing the multi-role capabilities of the F-35A.
- ✓ Conduct training activities at outlying airfields.
- ✓ Employ defensive flare countermeasures in airspace authorized for their use.
- ✓ Employ F-35A lasers and inert or live munitions at approved ranges within training and comprehensive public safety regulations.
- ✓ Perform supersonic training in approved airspace.

2.2 Alternative Narrowing Process

The alternative narrowing process used to identify alternatives for the F-35A training basing locations is described below. The process applied operational and other criteria to provide reasonable alternatives for the beddown of up to 144 F-35A PTC aircraft.

2.2.1 Initial Basing Decisions

To meet upfront training demand by the Services and worldwide partnering countries, it was decided that the most efficient and effective method of creating F-35 expertise was establishment of a Joint Strike Fighter Initial Joint Training Site (IJTS). This first training site would consolidate initial instruction of entry-level pilots and maintenance technicians for the Air Force, U.S. Navy (USN), U.S. Marine Corps (USMC), and partner nations and serve as the nucleus for initial training of personnel on safely operating and maintaining the new Joint Strike Fighter (JSF) (F-35) aircraft. The IJTS has subsequently been named the Integrated Training Center (ITC). Initially, the ITC would produce qualified aircrew and maintenance instructors and in the long term, it would continue to produce trained personnel for the life of the program. However, as production of F-35 aircraft progresses, additional training organizations would be required to support the increase in demand for trained personnel. It was determined that training requirements beyond the ITC capacity would be provided by F-35 PTCs established by each Service, international partner, or FMS nation per their particular infrastructure and capacity requirements.

For the ITC, the U.S. Department of Defense (DoD) directed that selection of the recommended basing location be guided by the Base Realignment and Closure (BRAC) process. This process included support from the Air Force and USN and involved a broad look across all service locations for joint opportunities. BRAC deliberation for selecting the ITC location was predicated on a list of factors to meet JSF training requirements, and the resulting selection,

announced on September 8, 2005, was Eglin Air Force Base (Eglin AFB), Florida. On July 29, 2010, the Air Force announced a preferred alternative in the *Eglin Base Realignment and Closure Draft Supplemental Environmental Impact Statement* (Air Force 2010c) to limit the beddown to 59 F-35 Primary Aircraft Authorized (PAA). This number included 24 F-35A variants for the Air Force, 20 F-35B variants for the USMC, and 15 F-35C variants for the USN. For the Air Force, this decision meant that only one squadron would be stationed at Eglin AFB, with subsequent squadrons needing additional basing locations.

2.2.2 Alternative Identification Process Methodology

On August 31, 2009, the Deputy Secretary of the Air Force Installations and Environment tasked a group of senior action-level representatives from the Air Force Secretariat, Air Staff, and selected Major Commands to identify potential candidate bases using the following planning conventions:

1. Identify the number of F-35A aircraft scheduled to be delivered between FY2013 and FY2017. This time period corresponded to the DoD Future Years Defense Program, which is the program and financial plan approved by the Secretary of Defense, and provides a basis for Air Force planning. Planning beyond this time period is speculative due to the indeterminacy of availability of resources.
2. Identify the number of F-35A aircraft to be allocated to training and to operations based on then-current national strategic considerations.
3. Determine the number of bases minimally needed to support receipt of these aircraft for training and operations by dividing the amount allocated to training and to operations by the number of squadrons based on four different squadron configurations: three squadrons of 72 PAA for training, three squadrons of 72 PAA for operations, one squadron of 24 PAA or 18 PAA for training, and one squadron of 24 PAA or 18 PAA for operations. These configurations represent the objective unit configurations for active duty and the Air Force Reserve Command (72 PAA and 24 PAA, respectively) and 18 PAA for the Air National Guard (ANG). Primary assigned aircraft are those assigned to meet the primary aircraft authorization and reflect the number of aircraft flown by a unit in performance of its mission.
4. For each of the four configurations (one squadron or three squadrons, training or operations), start at the top of that configuration's rank-ordered list and apply each pertinent military judgment factor to meet the minimal need.
5. Consider additional bases beyond the minimal need to ensure a sufficient range of reasonable alternatives is considered in subsequent analysis.
6. Of those bases considered, reach consensus to the reasons why a given base should or should not be considered as a candidate.
7. Ensure that no base appears both on the training and operations potential candidate lists.

To create the rank-ordered lists, the Air Force identified objective criteria to assess the Air Force installations' capacity to successfully support basing of the F-35A aircraft: mission, capacity, environmental considerations, and cost. The mission criterion consists of weather based on

days of 3 miles or better visibility at 3,000 feet above ground level (AGL) and airspace capacity to meet flying requirements. The capacity criterion consists of facility capacity (squadron operations and aircraft maintenance units and simulator bays, maintenance bays, corrosion control and munitions storage, fitness centers, child development centers, dormitories, and medical care facilities), the base's runway length and configuration, and available ramp space. The environmental criterion consists of a base's Clean Air Act attainment status, the local community's adopting zoning or other land use controls to preserve the base's flying operations, incompatible development in the Clear Zone (CZ) and/or Accident Potential Zone (APZ), and incompatible development within noise contours above 65-decibel day–night average sound levels. The final criterion is the base's construction cost factor, obtained from the DoD Facilities Pricing Guide, dated June 2007 (DoD 2007), as updated by the June 2009 draft OSD Pricing Guide (DoD 2009).

The Air Force also developed qualitative operational considerations apart from those discussed above to determine which bases should be selected for basing of the F-35A aircraft. These military judgment factors are as follows:

1. Plans and Guidance
2. Global Posture
3. Building Partnerships
4. Total Force
5. Beddown Timing
6. Force Structure
7. Training Requirements and Efficiencies
8. Logistics Supportability
9. Resources/Budgeting

As relevant to this EIS, this process resulted in the following conclusions. The planning considerations used to identify candidate bases were the best current estimate; the number and configuration of aircraft actually based will be determined by national security factors existing at the time of delivery and will be consistent with the results of this EIS.

1. **Aircraft To Be Delivered Between FY2013 and FY2017:** 273, of which 12 PAA will be based at Edwards AFB for operational test and evaluation and 36 PAA will be based at Nellis AFB for the Force Development Evaluation Program and the Weapon School by prior decisions.

2. **Aircraft for Training:** 98 PAA.

3. **Minimally Needed Bases for Subsequent Analysis for Training:** Three bases for the three-squadron configuration and three bases for the one-squadron configuration. The figure for the three-squadron configuration was derived by dividing the total PAA for training by the 72-PAA squadron size (resulting in two bases) and adding 50 percent of the minimal need figure to allow for contingencies should the first two bases be determined in subsequent environmental and site analysis to be unavailable. The figure for the one-squadron configuration was derived similarly using 18 PAA.

While this process determined the numbers of bases carried forward for detailed analysis to meet projected Air Force training requirements, the actual number of aircraft assigned and

bases used will be determined in light of national strategic considerations and F-35A aircraft availability as of this EIS's completion.

Training

The military judgment factors of Plans and Guidance and Global Posture do not provide meaningful distinctions between bases for Air Force training within the United States and its territories. Thus, they were not considered in evaluating individual bases. Also, the military judgment factor of Logistics Supportability, which equates to Lockheed's support capacity set forth in its contract with the Air Force, serves as a constraint on the total number of installations that can ultimately be selected for basing the F-35A. As the number of bases selected will not exceed that contractual capacity, this factor also did not distinguish between bases, nor did the number of bases identified as candidates approach this constraint. As such, it does not form part of the rationale for adding or removing a base from the list of reasonable alternatives for the training mission.

Training, Three-Squadron Configuration

- Boise AGS
- Eglin AFB
- Holloman AFB
- Luke AFB
- Tucson AGS

Training, One-Squadron Configuration

No bases were selected because this configuration, while included in the initial analysis for comparison purposes, was not cost-effective.

Subsequent to the candidate basing process, the airspace associated with Eglin AFB was determined to be too congested to support the basing of more F-35A training aircraft than are already scheduled to be based at Eglin AFB to support the ITC. As a result, Eglin AFB was eliminated as an alternative for the basing of aircraft that are the subject of this EIS.

2.3 Alternatives

The four alternative training bases evaluated in this *F-35A Training Basing Environmental Impact Statement (F-35A Training EIS)* are (1) Boise AGS, Idaho; (2) Holloman AFB, New Mexico; (3) Luke AFB, Arizona; and (4) Tucson AGS, Arizona.

2.3.1 Boise AGS, Idaho

Boise AGS is a military installation dating from World War II and covering the southern half of the public Boise Air Terminal Airport, which is operated as a joint military/civilian facility. Boise AGS is the location for the 124th Wing (124 WG) of the Idaho Air National Guard and includes components of the Army National Guard and ANG. Boise AGS covers 576 acres of land at an average elevation of 2,871 feet. The 124 WG supported two flying units, the 190th Fighter Squadron (190 FS) and the 189th Airlift Squadron (189 AS). The 190 FS operates and maintains the A-10 Thunderbolt II aircraft and performs interdiction, Close Air Support, joint

maritime operations, joint air attack team, combat search and rescue, and airborne forward air control. As part of the 2005 BRAC decision, the mission at Boise AGS was restructured, the four C-130 aircraft operated and maintained by the 189 AS were removed from the 124 WG, the inventory of A-10s was increased from 15 A-10 PAA to 18 A-10 PAA, and the 124 WG was renamed the 124 Fighter Wing (124 FW).

2.3.2 Holloman AFB, New Mexico

Holloman AFB, located near Alamogordo, New Mexico, is part of Air Combat Command (ACC). Holloman AFB is home of the 49 WG, German Air Force training, and various test programs, including the world's longest rail test track. The F-22, T-38A, QF-4, and Tornado aircraft have been based at Holloman AFB. Holloman AFB covers 59,639 acres of land at an average elevation of 4,093 feet. Facilities and infrastructure for stealth fighter aircraft were developed at Holloman AFB during the 1990s. Between 1992 and 2008, Holloman AFB hosted the stealth F-117A aircraft with 50 F-117As and 17 associated T-38A chase planes. In 2006, the Air Force proposed that the F-117A be retired and replaced with the multi-role, supersonic-capable F-22. The last F-117A left Holloman AFB in 2008. Beginning in 2009, the F-22 arrived at Holloman AFB and was proposed to reach a full complement of 36 PAA. On July 29, 2010, the Department of the Air Force announced plans to consolidate the F-22 fleet, resulting in transfer of the F-22s from Holloman AFB to other locations hosting F-22 squadrons. All F-22 aircraft are expected to be removed from Holloman AFB by FY2013. To utilize the extensive infrastructure and assets at Holloman AFB following the departure of the F-22s, the Air Force scheduled the basing of the F-16 Formal Training Unit (FTU), which comprises 50 F-16 PAA. The relocation of the F-16 FTU was analyzed in the *Recapitalization of the 49th WG Combat Capabilities and Capacities Environmental Assessment*, dated July 29, 2011 (Air Force 2011a). The F-16 FTU is expected to complete its beddown in FY2013. Additionally, in April 2009, Holloman AFB was selected for the basing of two FTUs of remotely piloted aircraft (RPA). Once the beddown of the formal training units is complete, a total of 38 MQ-9 and MQ-1 RPAs would be located at Holloman AFB, with a total of 800 personnel. Therefore, baseline conditions at Holloman AFB for this analysis include the full complement of the F-16 FTU, MQ-9, MQ-1, T-38A, and QF-4.

2.3.3 Luke AFB, Arizona

The base that became Luke AFB was established a substantial distance west of Phoenix in 1941. Pilots for most Air Force fighter aircraft since the F-100 have trained at Luke AFB. Luke AFB covers 3,054 acres of land at an average elevation of 1,085 feet, and the base has recently supported up to 10 training squadrons and over 192 PAA F-16 aircraft. As a result of the 2005 BRAC recommendations, the Air Force redistributed or retired 22 F-16s from the 56 FW and 15 F-16s from the 944 FW. The BRAC drawdown reduced the F-16 aircraft inventory at Luke AFB from 192 to 168.

2.3.4 Tucson AGS, Arizona

Tucson AGS was founded in 1956 and is collocated on the northwestern corner of the Tucson International Airport in southern Arizona. Tucson AGS covers 94 acres of land at an average elevation of 2,643 feet. Tucson AGS hosts the 162nd Fighter Wing (162 FW), comprised of two F-16 squadrons with 47 F-16 PAA and is the largest ANG fighter wing in the country. Also

located at Tucson AGS is a single 12 F-16 Block 60 PAA FMS squadron and 6 F-16 Test Center (ACC) aircraft. The mission of the 162 FW is to train Air Force and international partners on the F-16, as well as to support Davis-Monthan AFB, Arizona, with a fighter alert mission and to support Operation Snowbird, in which units from around the world come to Arizona to train in optimal weather conditions. The 162 FW also cooperates with Davis-Monthan AFB in conducting live-fire exercises. Live munitions are not stored at Tucson AGS; therefore, for live-fire exercises, the 162 FW must transit to Davis-Monthan AFB for weapons loading.

2.3.5 Alternatives Considered but Not Carried Forward

Eglin AFB was initially considered to receive up to 107 F-35A training aircraft, consisting of 48 F-35A training aircraft in addition to the 59 Joint Strike Fighter (JSF) aircraft already identified for the JSF ITC in the February 2009 Record of Decision for the *Proposed Implementation of the Base Realignment and Closure (BRAC) 2005 Decisions and Related Actions at Eglin AFB Final Environmental Impact Statement* (Air Force 2009). Consequently, the 48 F-35A additional training aircraft would not be delivered to Eglin AFB and Eglin AFB is, therefore, not a reasonable alternative to be considered for a PTC beddown.

2.4 F-35A Training Program Requirements

Resource requirements associated with the F-35A training concept are facilities to house classrooms, virtual trainers, flying training squadrons, maintenance and logistic support, airfield operation surfaces, and installation operation infrastructure. Along with the facility and equipment resources, the training operations would require all of the administrative, operational, and instructor personnel necessary to implement the F-35A Training System. For operations, additional resource requirements would be sufficient airspace for daily training activities, and sufficient air-to-ground capable land areas for weapons training.

These resource requirements are directly related to the number of aircraft proposed at each of the candidate bases.

F-35A flight training is one of the most fluid issues being addressed in this EIS. Throughout the planning process to execute F-35A flight training activities, it has become apparent that there will be various uncertainties until the operations can be learned and tested over time. F-35A flight training requirements are considered initial requirements due to various factors, primarily the relative immaturity of the F-35A aircraft. The Air Force anticipates a continued large learning curve in terms of overall capabilities-related training requirements. Given this learning curve, and other reasons discussed below, the Air Force will manage evolution in the F-35A training program by incorporating an adaptive management approach to the proposed basing of the F-35 aircraft at any of the alternative locations.

Adaptive Management is an approach recognized by the President's Council on Environmental Quality to facilitate meeting NEPA Section 101 goals. This approach is the continuous modification of management practices in order to achieve both project objectives and environmental protection. Such an approach shifts thinking away from the old project paradigm of "predict, mitigate, and implement" to "predict, mitigate, implement, monitor, and adapt." "Adaptive management recognizes the limits of knowledge and experience and moves iteratively toward goals in the face of uncertainty" (CEQ 1997).

Until the flying operations are initiated and tested over time, there are some uncertainties associated with how the F-35A flight operations may be implemented and what the resulting impacts might be. The F-35A training program at any of the alternative locations would be managed in such a way as to allow various alterations as the program matures and new program specifics are learned. Consequently, an adaptive management approach will be implemented to assist in this maturation process. As a result of adaptive management, this EIS addresses four alternative locations with multiple training scenarios for each location, for maximizing the implementation of flight training activities.

The Air Force has analyzed the beddown of aircraft in 24-aircraft increments, as identified in Table 2–2, at the four candidate locations. While the alternative narrowing process discussed in Section 2.2.2 determined that beddown scenarios with 24 or 48 aircraft would not be cost-effective, these scenarios are considered in this EIS to evaluate the full range of potential environmental consequences at each of the alternative locations. The Air Force is taking into consideration the beddown numbers of F-35A aircraft with and without currently based or scheduled to be based aircraft, as depicted in Table 2–2. This analysis of aircraft types and numbers is being accomplished to facilitate potential future decisionmaking with respect to F-35A basing and to provide for comprehensive National Environmental Policy Act (NEPA) planning. The actual number and configuration of aircraft potentially based at any time in the future will be determined by national security factors existing at the time of delivery and will be consistent with the results of the EIS and other related factors. Eventually, the number of aircraft assigned and bases used in support of the F-35A mission could change in light of national strategic considerations and F-35A production and availability.

Table 2–2. Comparison of Baseline Conditions and F-35A Scenarios at Each Alternative Base

Alternative	***Aircraft Scenarios***						
Boise AGS	**Baseline Conditions**	**B1**	**B2**	**B3**	**Not applicable**	**Not applicable**	**Not applicable**
	18 A-10s	18 A-10s	-18 A-10s	-18 A-10s			
		+24 F-35As	+48 F-35As	+72 F-35As			
Net Change		+24	+30	+54			
Holloman AFB Scenarios H1W, H2W, H3W	**Baseline Conditions**	**H1W**	**H2W**	**H3W**	**Not applicable**	**Not applicable**	**Not applicable**
	50 F-16s	50 F-16s	50 F-16s	50 F-16s			
		+24 F-35As	+48 F-35As	+72 F-35As			
Net Change		+24	+48	+72			
Holloman AFB Scenarios H1, H2, H3, H4, H5	**Baseline Conditions**	**H1**	**H2**	**H3**	**H4**	**H5**	**Not applicable**
	50 F-16s	-50 F-16s	-50 F-16s	-50 F-16s	-50 F-16s	-50 F-16s	
		+24 F-35As	+48 F-35As	+72 F-35As	+96 F-35As	+120 F-35As	
Net Change		-26	-2	-22	+46	+70	
Luke AFB	**Baseline Conditions**	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**
	142 F-16s	-142 F-16s	-142 F-16s	-142 F-16s	-142 F-16s	-142 F-16s	-142 F-16s
	26s F-16 (FMS)	26s F-16 (FMS)	26s F-16 (FMS)	26s F-16 (FMS)	26s F-16 (FMS)	26s F-16 (FMS)	26s F-16 (FMS)
		+24 F-35As	+48 F-35As	+72 F-35As	+96 F-35As	+120 F-35As	+144 F-35As
Net Change		-118	-94	-70	-46	-22	+2
Tucson AGS	**Baseline Conditions**	**T1**	**T2**	**T3**	**Not applicable**	**Not applicable**	**Not applicable**
	47 F-16s (ANG)	-47 F-16s (ANG)	-47 F-16s (ANG)	-47 F-16s (ANG)			
	6 F-16s (ACC)	6 F-16s (ACC)	6 F-16s (ACC)	6 F-16s (ACC)			
	12 F-16s (FMS)	+12 F-16s (FMS)	-12 F-16s (FMS)	-12 F-16s (FMS)			
		+24 F-35As	+48 F-35As	+72 F-35As			
Net Change		-23	-11	+13			

For both Boise AGS and Tucson AGS, the Air Force has decided to limit the basing scenarios to up to 72 F-35A aircraft due to facility constraints. Beddown of additional F-35A aircraft at Boise AGS or Tucson AGS would require base expansion, runway construction, or establishment of new airspace, any of which would require more time than is available to beddown F-35A training aircraft beginning in FY2013. The basing scenarios at Holloman AFB evaluate from one to three increments of 24 F-35A aircraft in addition to the baseline of the F-16 FTU. To facilitate potential future decisionmaking with respect to F-35A basing and provide for comprehensive NEPA planning, the Air Force is also taking into consideration beddown of between one and five increments of 24 F-35A aircraft without the F-16 FTU (see Section HO 1.0). At Luke AFB, this EIS evaluates up to six increments of 24 training aircraft. The Air Force identified 72 F-35A aircraft at Luke AFB as the Air Force's Preferred Alternative for this EIS.

2.4.1 Training Program Facilities

To accommodate the F-35A training mission, the necessary facilities and infrastructure must be available. Table 2–3 summarizes the total affected area required to support the number of F-35A aircraft proposed at each of the locations being considered for the training program. While all of the candidate bases offer the basic necessary facilities for the beddown, none of the four alternative bases has all of the required infrastructure and facilities. Construction of new facilities and modification of existing facilities would be necessary at each base, although the nature and magnitude of these efforts would differ among the four bases depending on the availability of existing facilities. Affected area represents the area covered by the footprints of the proposed facilities, plus the surrounding lands where construction-related clearing and grading would occur. Infrastructure upgrades, such as connecting new facilities to water and power systems, would also add to the affected areas on the bases. Specific construction and renovation projects are identified in each base-specific section of Chapter 4.

Siting of new facilities at each of the alternative locations has not been finalized. The facility siting analysis for each candidate base would take into consideration several operational factors and environmental factors, briefly described below.

Operational Viability. The first criterion considered in siting facilities is operational viability. Sites that do not meet mission requirements are eliminated from further consideration.

Airfield Restrictions. To maintain safe operations, several restrictions are imposed. The Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design* (DoD 2008a), limits locations and heights of objects and facilities in the immediate vicinity of an airfield, thereby minimizing hazards to airfield and flight operations. Objects or facilities that do not meet these requirements require an approved waiver, a permissible deviation, or an exemption. Similar restrictions exist to minimize explosive or other safety risks.

Table 2–3. Affected Area for Facility and Infrastructure Construction

Base	***Total Disturbed Area (square feet)***
Boise AGS	
Scenario B1 (24 Aircraft)	1,746,051
Scenario B2 (48 Aircraft)	1,770,251
Scenario B3 (72 Aircraft)	1,816,451
Holloman AFB	
Scenario H1W (24 Aircraft)	3,483,068
Scenario H2W (48 Aircraft)	3,676,808
Scenario H3W (72 Aircraft)	3,870,549
Scenario H1 (24 Aircraft)	1,876,303
Scenario H2 (48 Aircraft)	1,920,413
Scenario H3 (72 Aircraft)	2,401,606
Scenario H4 (96 Aircraft)	2,542,717
Scenario H5 (120 Aircraft)	4,300,063
Luke AFB	
Scenario L1 (24 Aircraft)	679,631
Scenario L2 (48 Aircraft)	761,691
Scenario L3 (72 Aircraft)	814,051
Scenario L4 (96 Aircraft)	933,951
Scenario L5 (120 Aircraft)	985,651
Scenario L6 (144 Aircraft)	907,551
Tucson AGS	
Scenario T1 (24 Aircraft)	1,437,040
Scenario T2 (48 Aircraft)	1,453,540
Scenario T3 (72 Aircraft)	1,466,740

Note: Total disturbed area is estimated to be 10 percent larger than the footprint of the finished facility as a best engineering estimate to account for disturbance by construction activities, including laydown areas and utility connections.

Force Protection and Security Compliance. Facility location would meet the standards presented in UFC 4-010-0, *DoD Minimum Antiterrorism Standards for Buildings* (DoD 2003).

Safety Zones. The DoD establishes APZs and CZs to delineate recommended surrounding land uses for the protection of people and property on the ground. APZs and CZs define the areas in the vicinity of an airfield that would have the highest potential to be affected if an aircraft mishap were to occur. Construction of facilities within the APZ or CZ requires restrictions on the uses and heights of natural and manmade objects in the vicinity of air installations to provide for safety of flight and to ensure that people and facilities are not concentrated in areas susceptible to aircraft accidents. For civilian airports, the Federal Aviation Administration (FAA) Airport Design Standards include Runway Protection Zones that are similar in function to the DoD CZs.

Department of Defense Explosives Safety Board (DDESB) Standard 6055.9, *DoD Ammunition and Explosives Safety Standards* (DoD 2004), and Air Force Manual (AFMAN) 91-201, *Explosives Safety Standards* (Air Force 2011b), define distances that need to be maintained between munitions storage areas and a variety of other types of facilities. These distances, called quantity-distance (Q-D) arcs, are determined by the type and quantity of explosive material to be stored. Each

explosive material storage or handling facility has Q-D arcs extending outward from its sides and corners for a prescribed distance. Within these Q-D arcs, development is either restricted or prohibited altogether to ensure safety of personnel and minimize potential for damage to other facilities in the event of an accident.

Compatible Land Use. Land use is the classification of either natural or human-modified activities occurring at a given location. Land use is regulated by management plans, policies, and regulations determining the type and extent of land use allowable in specific areas and protection specially designated for environmentally sensitive areas. The installation master plans or general plans developed by each candidate base provide this guidance on the overall layout of the base and identify developmental opportunities and constraints. Projects were evaluated with respect to their compatibility with land use planning goals as laid out in these plans.

User Preference. The unit that would use the facility provides specific requirements or needs as to the location of the facility or its relationship to nearby facilities or infrastructure.

Space Availability. The cantonment area of a military installation includes the offices, support buildings, residential areas, community services, and aircraft service facilities needed to support the mission and secured within the boundaries of the installation. With the exception of Holloman AFB, the cantonment areas at Boise AGS, Luke AFB, and Tucson AGS are heavily developed. Therefore, space is limited, making the availability of suitable and sufficient land an important criterion. In some cases, an existing structure would be demolished to allow for construction of the new structure that would be built for the F-35A beddown.

Infrastructure Availability. Costs and any other challenges associated with accessing the proposed facility location with utilities and other supporting infrastructure were considered.

Environmental Factors. Environmental factors considered as part of the alternative selection process included location of wetlands/floodplains and presence of Environmental Restoration Program (ERP) sites as described below. The siting process accounts for these constraints to the extent possible.

Wetlands/Waters of the United States/Floodplains. The Clean Water Act (CWA) of 1977 (33 *United States Code* [U.S.C.] 1251 et seq.) regulates pollutant discharges that could affect aquatic life forms or human health and safety. Executive Order (EO) 11990, *Protection of Wetlands*, indicates "that the proposed action include all practicable measures to minimize harm to wetlands." Waters of the United States include any water body or watercourse that has been determined to be regulated under Section 404 of the Clean Water Act and may include ephemeral washes, drainage ditches, intermittent and perennial watercourses, and wetlands. Section 404 requires a permit from the U.S. Army Corps of Engineers for dredging and filling in waters of the United States. Floodplains are defined in EO 11988, *Floodplain Management*, as "the lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, the area subject to a 1 percent or greater chance of flooding in any given year" (that area inundated by a 100-year flood). EO 11988 requires Federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the

occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

Low-Impact Development. EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, requires the advancement of regional and local integrated planning through participation in regional transportation planning and recognition of existing community transportation infrastructure. In addition, the EO requires that the planning process for new facilities include consideration of sites that are pedestrian friendly, near existing employment centers, and accessible to public transit. In addition, EO 13514 requires that all new construction comply with the *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings*. This includes employing design and construction strategies that reduce stormwater runoff. Furthermore, Section 438 of the Energy Independence and Security Act of 2007 (P.L. 110-140) requires that any development or redevelopment project involving a Federal facility with a footprint exceeding 5,000 square feet use site planning, design, construction, and maintenance strategies to maintain or restore the predevelopment hydrology of the property with regard to temperature, rate, volume, and duration of flow. Compliance with this requirement can be met through the implementation of low-impact development technologies.

Environmental Restoration Program (ERP) Sites and Military Munitions Response Program (MMRP) sites. The DoD developed the ERP to identify, investigate, and remediate potentially hazardous material disposal sites that existed on DoD property prior to 1984. The MMRP was initiated by the DoD in 2001 to respond appropriately to all munitions-contaminated sites in the United States. Continuing efforts to comply with applicable laws and regulations ensure that present resource and waste management practices are performed in a manner that protects human health and the environment. To the extent possible, construction activities would be sited to avoid identified ERP and MMRP sites.

2.4.2 Training Program Personnel

Basing of the F-35A training mission would also require basing sufficient and appropriate personnel to operate and maintain the wing and to provide necessary support services. Table 2–4 summarizes the normal level of personnel to support the F-35A training mission for each location, including the number of contractor support personnel, F-35A students, instructors, and Base Operating Support personnel, as well as the dependents estimated to accompany the military and civilian personnel. Because of the short duration of F-35A training, it was assumed that students would not be accompanied by dependents.

Table 2–4. F-35A Training Mission Personnel and Dependents

F-35A Scenario (No. of Aircraft)	*A-10/ F-16 Mission Personnel*	*Other Base Personnel*	*F-35A Personnel*	*F-35A Contractors*	*F-35A Students[2]*	*Total Base Personnel*	*Net Change in Personnel*	*Depen-dents[1]*	*Total Base Population*	*Net Change*
Boise AGS										
Baseline Conditions	737	813	–	–	–	1,550	N/A	3,410	4,960	N/A
Scenario B1 (24)	737	813	598	50	30	2,228	678	4,836	7,065	2,105
Scenario B2 (48)	–	813	1,846	50	60	2,769	1,219	5,959	8,728	3,768
Scenario B3 (72)	–	813	2,356	50	90	3,309	1,759	7,082	10,391	5,431
Holloman AFB										
Baseline Conditions	1,068	5,664	–	–	–	6,732	N/A	6,141	12,873	N/A
Scenario H1W (24)	1,068	5,664	647	50	30	7,459	727	7,674	15,133	2,260
Scenario H2W (48)	1,068	5,664	1,157	50	60	7,999	1,267	8,796	16,795	3,922
Scenario H3W (72)	1,068	5,664	1,668	50	90	8,540	1,808	9,921	18,461	5,588
Scenario H1 (24)	0	5,664	647	50	30	6,391	(341)	5,325	11,716	(1,157)
Scenario H2 (48)	0	5,664	1,157	50	60	6,931	199	6,447	13,378	505
Scenario H3 (72)	0	5,664	1,668	50	90	7,472	740	7,571	15,043	2,170
Scenario H4 (96)	0	5,664	2,178	50	120	8,012	1,280	8,693	16,705	3,832
Scenario H5 (120)	0	5,664	2,688	50	150	8,552	1,820	9,815	18,367	5,494
Luke AFB										
Baseline Conditions	1,907	4,935	–	–	–	6,842	N/A	9,821	16,663	N/A
Scenario L1 (24)	–	4,935	1,449	50	30	6,464	(378)	8,923	15,387	(1,276)
Scenario L2 (48)	–	4,935	1,959	50	60	7,004	162	10,045	17,049	386
Scenario L3 (72)	–	4,935	2,470	50	90	7,545	703	11,170	18,715	2,052
Scenario L4 (96)	–	4,935	2,980	50	120	8,085	1,243	12,292	20,377	3,714
Scenario L5 (120)	–	4,935	3,490	50	150	8,625	1,783	13,414	22,039	5,376
Scenario L6 (144)	–	4,935	4,001	50	180	9,166	2,324	14,538	23,704	7,041
Tucson AGS										
Baseline Conditions	904	1,042	–	–	–	1,946	N/A	4,281	6,227	N/A
Scenario T1 (24)	–	1,042	691	50	30	1,813	(133)	3,922	5,734	(493)
Scenario T2 (48)	–	1,042	994	50	60	2,146	200	4,590	6,736	509
Scenario T3 (72)	–	1,042	1,115	50	90	2,297	351	4,856	7,153	926

[1] The Air Force assumes 2.2 dependents per military member and contractor.
[2] The Air Force assumes F-35A students would be unaccompanied by dependents.
Note: (Number) denotes a negative number.

2.4.3 F-35A Pilot Training Program

On April 12, 2003, the Joint Requirements Oversight Council validated the operational requirements and performance parameters for the F-35A. The F-35A is a multi-role fighter to replace and supplement the F-16 and the A-10 and to complement the F-22. The F-35A missions would be day/night Attack Operations/Air Interdiction, Offensive Counter Air (airfield attack), Close Air Support (CAS), Strategic Attack, Suppression of Enemy Air Defenses, and Defensive Counter Air. Additional Air Force F-35A missions include Armed Reconnaissance, Forward Air Controller (Airborne), and Night Systems.

Directly related to the value of the F-35A in accomplishing the multiple missions for which it is designed are the capabilities of the pilots who employ it. For this reason, establishing infrastructure to support the creation and sustainment of quality pilots is vitally important. For a new weapons system such as the F-35A, the training force is first established in sufficient size to create the operational frontline pilot force and sustain the continuous demand for qualified pilots. Based upon the Air Force's planned acquisition of F-35A aircraft, the Air Force needs to establish 11 F-35A training squadrons of 24 PAA aircraft each. In addition, the Air Force is expected to support F-35A training for both the international partners and potential FMS countries. Current estimates predict that the Air Force might have to plan for up to two training squadron's equivalent for international partners and up to two training squadron's or more equivalent for FMS. Therefore, the total training requirement for the Air Force could necessitate up to 15 or more F-35A training squadrons within the 30-year acquisition program. This *F-35A Training EIS* addresses the training program requirements for up to 144 aircraft.

The pilot training being developed for the F-35A is composed of three elements of learning. First is academics designed to provide essential aircraft system knowledge, procedural memorization for safe operation, and tactical employment theory for combat operations. Second, several types of virtual and part-task trainers and flight simulators are designed to bridge academics and actual flying with hands-on manipulation of the aircraft and associated systems. Third, actual aircraft operation is performed to build flight-specific habit patterns, develop situational awareness, physiologically acclimate the pilot to the high-performance environment, and achieve sufficient levels of required proficiency.

2.4.3.1 Pilot Training Courses

For the F-35A PTC, several courses will be designed to accommodate the various levels of training. These courses include Basic Initial Qualification Training ("B" Course), Transition/Conversion/Refresher/Requalification Training ("TX" Courses), instructor training ("I" Course), and senior officer training ("SOC"). These courses constitute a spectrum of training with separate, specifically designed syllabi guiding the requisites necessary to complete the course and provide the essential skills to meet the mission-qualified pilot criteria. Which course a pilot is enrolled in depends upon the experience level and expected assignment following training. The following main categories constitute F-35A PTC training courses:

1. **Basic Course (B):** This course is designed for students that will enter an F-35A PTC following graduation from advanced pilot training programs and pilots coming from non-fighter/attack aircraft. This course is approximately 8 months in length and

involves extensive classroom academics, simulator instruction, and flight operations. A description of actual flight operations is presented in Table 2–5. Among these descriptions, training events would include such skills as formation flying, advanced aircraft handling, and tactics and weapons employment related to the different missions expected of the multi-role F-35A.

2. **Transition Courses (TX):** These courses are designed for experienced pilots entering the program from another fighter/attack aircraft platform. This training is a shorter version of the B Course that is tailored to the individual's aircraft type and experience level. The TX Course is further broken down to re-training pilots who have previously flown the F-35A and are returning to the aircraft, or converting from one model of F-35A to a newer model. These latter TX Courses are shorter in length due to the pilots' previous fighter/attack experience.

3. **Instructor Course (I):** This course is designed for F-35A qualified pilots who have been selected to upgrade to F-35A Instructor Pilots.

4. **Senior Officer Courses (SOCs):** These courses are tailored to each Senior Officer's individual experience level to provide minimum proficiency in the F-35A. These courses are typically short in length, less than a month, and introduce required skill sets to safely fly the F-35A.

Because the F-35A Program is new, syllabus development is ongoing. However, the F-35A Program Office has outlined a preliminary notional "B" Course. This "syllabus" provides the best estimate of the types of operations that can be anticipated with the F-35A. While the various syllabi have varying requisites and quantity of events, the relative percentage breakout of operations of the "B" Course provides a reasonable approximation of the total delineation of operations across all the syllabi (see Table 2–5 for a description of the various training elements/missions and their expected percentage of the total operations). The F-35A training syllabus is adjusted at each alternative base to account for local flying conditions such as airfield elevation and runway lengths. Discussions of the training syllabus in this chapter focus on the general training syllabus, while the base-specific sections of Chapter 4 discuss the training syllabus as it applies to each location.

Table 2–5. F-35A Basic Course Training Missions

Mission	*Description*	*Required Airspace*	*Minimum (Altitude 1,000s of feet/miles Dimension)*	*Recommended (Altitude 1,000s of feet/miles Dimension)*	*Sortie Duration (Hours)*
Familiarization	Flight operations orientation through familiarization flight and pre- and post-flight briefings.	MOA/ATCAA	Day: 10–25/20×20	10–50/40×40	1.5
Formation	Visual and Beyond Visual Range (BVR) formation flight activities.	MOA/ATCAA	Two Ship: 10–25/20×20 Four Ship: 10–25/20×40	10–25/20×40 10–50/40×40	1.5
Basic Air-to-Ground	Air-to-ground delivery of simulated ordnance on range target areas.	MOA/ATCAA Restricted Area	Surface–30/20×40	Surface–30/40×40	1.5
Close Air Support (CAS)	Direct support to ground forces in close proximity to enemy forces through coordination with Forward Air Controller, precise location of friendly troops, and simulated delivery of ordnance on enemy positions.	MOA/ATCAA Restricted Area	Surface–30/20×40	Surface–30/40×40	1.5
Reconnaissance	Visual and radar surveillance of enemy locations and activities.	MOA/ATCAA Restricted Area	10–30/20×40	Surface–50/40×40	1.5
Low-Altitude Training	Offensive/defensive operations at low altitude for G-force awareness, tactical formations, navigation, threat awareness, defensive response/countermeasure use, intercepts, missile defense, and combat air patrol.	MOA/ATCAA MTR Restricted Area	Surface–30/20×40	Surface–50/40×40	1.5
Tactical Intercepts	Detection and interception of target aircraft.	MOA/ATCAA	Day: 10–30/20×40 Night: 5–30/20×40	Surface–50/40×40 5–50/40×60	1.5
Basic Fighter Maneuvers (BFM)/ Aircraft Handling Characteristics (AHC)	Fundamental training in maximum performance maneuvering and air-to-air combat with two aircraft practicing individual offensive, defensive, and high-aspect maneuvering against each other.	MOA/ATCAA	10–30/20×20	5–50/40×40	1.5 / 1.3
Air Combat Maneuvers (ACM)	Intra-flight coordination, survival tactics, and two-ship maneuvering against an adversary.	MOA/ATCAA	10–30/20×20	5–50/40×40	1.5

Mission	*Description*	*Required Airspace*	*Minimum (Altitude 1,000s of feet/miles Dimension)*	*Recommended (Altitude 1,000s of feet/miles Dimension)*	*Sortie Duration (Hours)*
Offensive Counter Air (OCA) and Defensive Counter Air (DCA)	Offensive and defensive measures designed to detect, identify, intercept, and destroy/negate enemy forces close to its source or while attempting to penetrate the friendly force environments.	MOA/ATCAA Restricted Area	10–50/40×60	Surface–50/40×80	1.5
Interdiction	Operations to destroy, neutralize, or delay enemy advances against friendly forces.	MOA/ATCAA Restricted Area	Surface–30/20×40	Surface–50/40×40	1.5
Suppression of Enemy Air Defense (SEAD)/Destruction of Enemy Air Defenses (DEAD)	Collective use of tactics, ordnance, and avionics with specific objectives of suppressing or destroying ground-based weapons systems that could threaten friendly aircraft and ground forces.	MOA/ATCAA Restricted Area	5–30/20×40	Surface–50/40×40	1.5
Strike	Use of precise timing maneuvers during ingress to and egress from target area and reforming into a tactical formation.	MOA/ATCAA Restricted Area	Surface–30/20×40	Surface–50/40×40	1.5
Air Combat Tactics (ACT)	Tactics training where opposing friendly and enemy aircraft formations maneuver against each other to achieve tactical advantage and decisive weapons employment.	MOA/ATCAA	10–50/40×60	Surface–50/40×80	1.5
Air-to-Air Refueling	Practice in refueling operations conducted in conjunction with other syllabus training.	AAR Track	10–30/ Approved Refueling Track	10–40/ Approved Refueling Track	0.5
Night Systems	Introduction and training with system capabilities that facilitate night operations.	MOA/ATCAA	10–25/20×20	10–50/40×40	1.5

Key: AAR=Air-to-Air Refueling; ATCAA=Air Traffic Control Assigned Airspace; MOA=Military Operations Area; MTR=Military Training Routes.

2.4.3.2 Pilot Training Flying Operations

This section describes the requirements for the F-35A flying operations, which include operations at a main operating base, auxiliary airfields, and in Special Use Airspace (SUA). To provide a measure that can be applied to various alternatives, operations are quantified by squadron-sized organizations. For the F-35A, the typical-sized Air Force fighter squadron will have a PAA of 24 aircraft.

Many factors combine to influence how flight operations are conducted. These factors include differences in mission area emphasis, aggregate experience of personnel, geographical composition of available airspace and range resources, regional weather, etc. For instance, operations from an F-35A training unit will differ from a combat-ready operational F-35A unit with much higher percentages of basic flight familiarization, low-altitude and air-refueling training and less emphasis on Close Air Support, surface attack tactics and Suppression of Enemy Air Defenses/Destruction of Enemy Air Defenses (SEAD/DEAD) missions. In a similar manner, flight operations will vary from one training location to another. Although training operations are very structured, local area factors, varying training techniques, and organizational leadership influence would result in some variation of syllabus execution. Variation will also be encountered at a single location from year to year as changes in weather, local air traffic, experience levels of students, etc. influence conduct of the flying program.

The F-35A has been flying during testing since 2006. Operational pilot training has not yet begun, so information from existing pilot training is unavailable. F-35A noise emission, personnel, facility, munitions, and related support have been identified from ongoing testing. The F-35A will have undergone approximately 10 years of flight testing prior to initiation of pilot training at any of the bases under consideration in this EIS. For the environmental analysis, training flight requirements were modeled with the best information available. This modeling was derived from a combination of existing F-35A flight information, projected capability employment profiles, preliminary training syllabus development, and comparison to existing aircraft platforms with similar capabilities. While capability differences exist, operations from the multi-role F-16 are expected to closely mirror the anticipated operations of the F-35A in terms of training flight profiles, airspace use, and frequency of events. The Air Force anticipates that as the F-35A matures as a weapons system, a continued learning curve can be expected in regards to overall capabilities and related training requirements. Over time, adjustments to training operations are expected as training and F-35A capability develops.

The term ***sortie*** is the flight of a single aircraft from takeoff through landing, including performance of a mission or training event. A typical training sortie involves students and instructors departing to fly to their assigned airspace. The type of tactical maneuvers and training that needs to be accomplished would dictate the time and airspace necessary to complete the requirements. Some of the advanced training requires airspace that can accommodate the tactical maneuvers of up to eight aircraft simultaneously. The students may then head to an auxiliary airfield for additional training that involves various field approaches and landings, such as a straight-in landing, an overhead break (overflying the airfield, then maneuvering within visual sight of the runway to get in a position to safely land), touch-and-go landings, conventional landings, closed patterns, or simulating a flameout. Students may also use the main operating base airfield for pattern and approach, depending on how busy the main airfield is. Typically, most of the activity at the main airfield would be launches and recoveries of aircraft.

Around an airfield, ***airfield operations*** are categorized as takeoffs, landings, closed patterns (which would include activities referred to as touch-and-go operations, go-around's, or low approaches), or inter-facility transfers. A closed pattern occurs when the pilot pulls the aircraft steeply to pattern altitude, within approximately 1.5 miles of the runway, to set up for another landing. Since a closed pattern operation essentially consists of a landing and a takeoff, it is

considered two operations. An inter-facility transfer occurs when an aircraft flies from one airfield to another airfield to perform a training event. Table 2–6 presents the representative F-35A base sortie information. Specific information for the alternative bases, adjusted for local conditions, is presented in the base-specific sections of Chapter 4.

Table 2–6. Representative Aircraft Sortie Information That Can Be Applied to F-35A Training Activities

Aircraft Sortie Information
Departures
Two-Ship – 88% / Four-Ship – 12%
Military Power – 90% / Afterburner – 10%
Arrivals
Overhead – 56% / Straight-In – 36% / Simulated Flameout to Arrival – 8%
Go-Around
Visual Closed Pattern – 94% / Radar Pattern – 6%

The Air Force Flying Hour Program is based on peacetime training requirements and consists of the flying hours necessary to train aircrews to safely operate their aircraft and sustain them in numbers sufficient to execute their core tasked mission. The Air Force Flying Hour Model provides the methodology and processes that Major Commands use to build their flying hour programs. This model determines the number of flying hours needed to attain and maintain combat readiness for all aircrews, test weapons and tactics, and fulfill collateral requirements. For FTUs, the mathematical description is as follows: average daily student load multiplied by the average number of flying hours per student per day, multiplied by the number of training days determines the number of required student flying hours, which determines force structure. While this methodology provides the fundamental framework for establishing and justifying the required flying hours, the actual outcome is the result of additional dynamic programmatic factors combined with fiscal constraints. For the F-35A, the flying hour program has been established for planning and acquisition purposes at 25 hours per aircraft per month. Table 2–7 lists the hour and sortie projections for the F-35A and provides a comparison with current FTU program numbers for the F-16 and A-10. Table 2–8 lists the estimated annual sortie projections based upon organizational structures comprising from one to six squadrons. Table 2–9 lists the altitudes at which the F-35A training events would typically be conducted as compared to the F-16 and A-10.

Table 2–7. F-35A, F-16, and A-10 Flying Hour Program Comparison

Aircraft	*Monthly Flying Hours/ Aircraft*	*Monthly Utilization Rate*	*Average Sortie Duration*	*Average No. of Daily Sorties/ 24 aircraft*	*Annual No. of Sorties/ Aircraft*	*Annual No. of Sorties/ 24 PAA*
F-35A	25.00	17.00	1.47	22	204	4,896
F-16	24.26	17.84	1.36	23	214	5,136
A-10	34	17.00	2.00	22	204	4,896

Table 2–8. Annual F-35A Sortie Projections

24 F-35A Aircraft	*48 F-35A Aircraft*	*72 F-35A Aircraft*	*96 F-35A Aircraft*	*120 F-35A Aircraft*	*144 F-35A Aircraft*
4,896	9,792	14,688	19,584	24,480	29,376

Table 2–9. Percentage of Flight Hours by Altitude

Altitude (Feet)	*Percentage of Flight Hours*		
	F-35A	**F-16**	**A-10**
> 30,000 MSL	6	1	0
18,000–30,000 MSL	34	3	0
10,000 AGL–18,000 MSL	45	40	4
5,000–10,000 AGL	8	26	33
2,000–5,000 AGL	4	13	26
500–2,000 AGL	3	14	30
100–500 AGL	0	3	7

2.4.4 Training Airspace and Ranges

The FAA has designated the airspace within the United States as Controlled, Special Use, Other, or Uncontrolled airspace. A ***sortie-operation*** is the use of one airspace unit (described below) by one aircraft. The number of sortie-operations is used to quantify the number of times a single aircraft uses an airspace unit and is not a measure of how long an aircraft uses an airspace unit. SUA identified for military and other governmental activities is charted and published by the FAA. SUA is designated airspace within which flight activities are conducted that requires confinement of participating aircraft or may place operating limitations on nonparticipating aircraft. SUA includes Restricted Areas and Military Operations Areas (MOAs) (see definitions in Figure 2–1).

The F-35A training syllabus directs pilots to fly on Military Training Routes (MTRs) not below 500 feet AGL. Flight simulator test runs indicate that 70 percent of total time on MTRs would be spent at altitudes between 500 and 750 feet AGL, with the remaining time being spent at altitudes between 750 and 1,500 feet AGL. Additional discussion of these airspace units and how they are managed is included in Chapter 3, Section 3.1.

Training airspace and ranges for the F-35A need to be less than 120 nautical miles from the main operating base to permit pilots to achieve desired training during a sortie. Air refueling tracks and low-level routes near the main operating base are also needed for efficient training. Some F-35A training missions would include supersonic speeds and require approved airspace for supersonic flight operations.

Through the evaluation of the available training program for the F-35A, the Air Force identified existing airspace and ranges for F-35A training. These existing airspace and ranges fall into two categories: (1) primary use and (2) occasional use. Airspace and ranges defined as primary use would receive substantial use by the F-35A on a daily basis. These primary use airspace units and ranges, as well as the number of sortie-operations in each, are identified in Section 2.0 of each base-specific section within Chapter 4. While predominant F-35A training operations would occur in the airspace, ranges, and auxiliary airfields identified as primary use, the F-35A

would not be limited to using only those areas. The F-35A may conduct operations in other SUA, on other ranges, and at other airfields within the nationwide SUA, Air Traffic Control Assigned Airspace, MTR, and auxiliary airfield network, which can be defined as occasional use.

Occasional use airspace and ranges would generally receive only infrequent use by the F-35A. Some ranges are managed by other DoD commands, which receive priority scheduling for their training purposes. From time to time, legacy aircraft venture to occasional use airspace and ranges to conduct operations beyond their primary use airspace and ranges. The F-35A is expected to do the same.

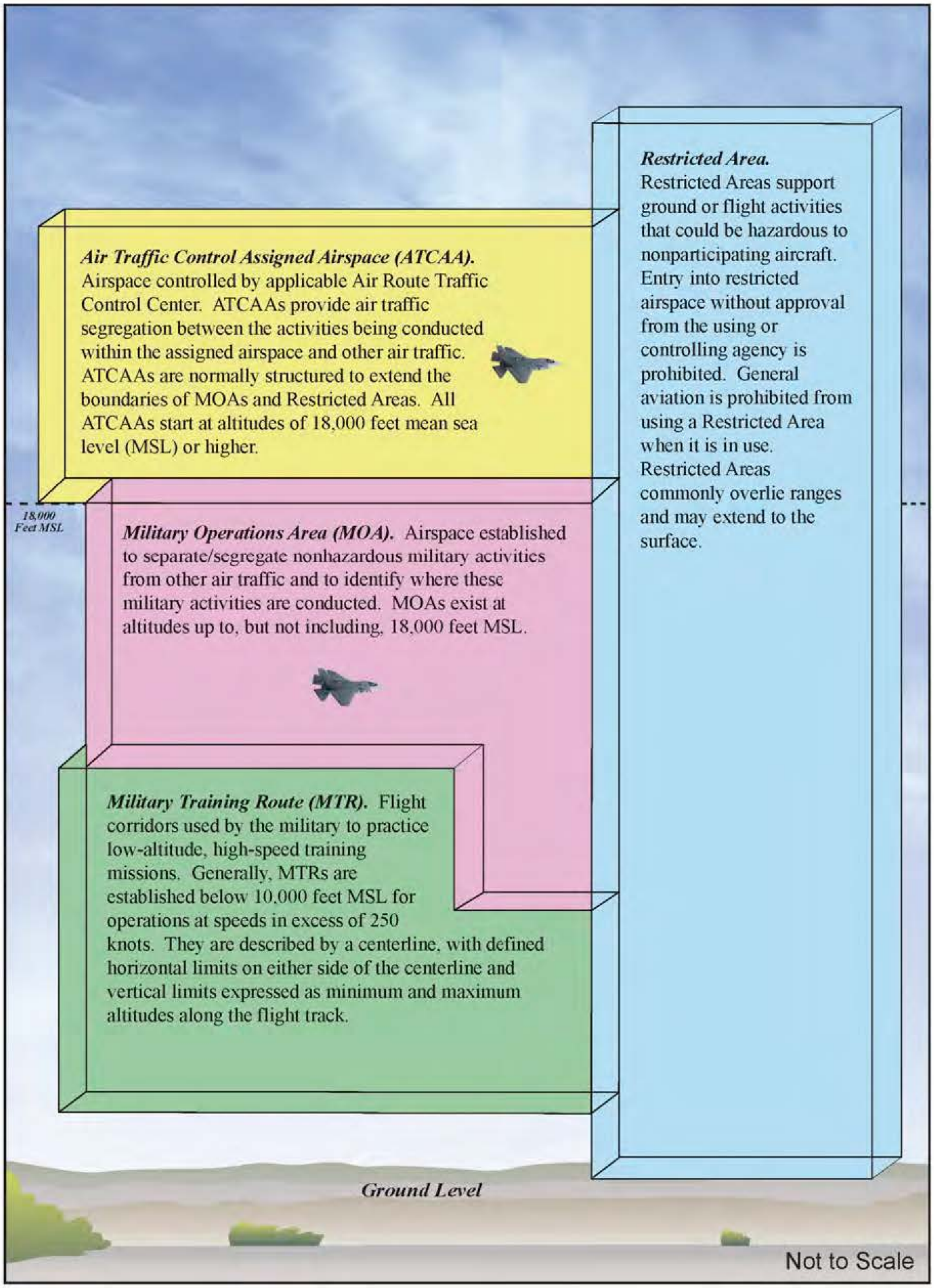

Figure 2–1. Types of Special Use Airspace for F-35A Training Aircraft

2.4.5 Ordnance and Defensive Countermeasures

F-35A flight training missions would use ordnance, such as laser and global positioning system (GPS) Guided Bomb Units (GBUs). Table 2–10 lists the annual ordnance use during training associated with different aircraft scenarios. Some of the required F-35A training includes the use of 25-millimeter Target Practice (TP) ammunition during strafing runs. Most of these strafing events would be associated with Basic Air-to-Ground and CAS training events. Ordnance use would include both live and inert bombs identified in Table 2–10.

Table 2–10. Projected F-35A Annual Ordnance Use

	Annual F-35A Usage					
Ordnance Type	**24 Aircraft**	**48 Aircraft**	**72 Aircraft**	**96 Aircraft**	**120 Aircraft**	**144 Aircraft**
GBU-12 (live)	36	72	108	144	180	216
GBU-12 (inert)	78	156	234	312	390	468
GBU-31 (inert)	20	40	60	80	100	120
GBU-32 (inert)	26	52	78	104	130	156
25 mm TP	52,000	104,000	156,000	208,000	260,000	312,000
MJU-61/B Training Flare	26,400	52,800	79,200	105,000	132,000	158,400

F-35A pilots are not planning to train with chaff. The F-35A is equipped with a low-visibility coating that provides protection from radar detection. The dispensing of chaff would illuminate the aircraft position and be counterproductive to stealthy tactics. Tactics could change some time in the future, but at this time, chaff is not included in the training syllabus. As for electronic countermeasures, adverse interference issues at the alternative basing locations are not anticipated. By law, practices and procedures have been established at the international and national levels to ensure equitable use of the RF spectrum. In the United States & Possessions (US&P), the National Communications Act of 1934, as amended, delegated this responsibility to the National Telecommunications Information Administration (NTIA). The NTIA establishes the guidelines for Federal agencies. Title 47, United States Code (U.S.C.), Telegraphs, Telephones, and Radiotelegraphs, Section 151 et seq., The Communications Act of 1934, established separate control of Federal (government) and non-federal (civilian) use of the electromagnetic spectrum. Under this act, the only government agencies that assign and control the use of frequencies in the US are the NTIA and the Federal Communications Commission (FCC). For the F-35A, the Under Secretary of Defense for Acquisition, Technology and Logistics (USD [AT&L]) sets policy for acquiring systems that use the electromagnetic spectrum and ensures compliance with electromagnetic spectrum support procedures. The Assistant Secretary of Defense develops overall DOD policy for managing and using the electromagnetic spectrum. Air Force activities are further governed by AFI 33-118, Radio Frequency Spectrum Management; AFMAN 33-120, Electromagnetic Spectrum Management, and AFI 10-707, Spectrum Interference Resolution Program.

F-35A students would also expend defensive flares during a portion of their flights. Flares are used to attract enemy heat-seeking missiles and lead them away from the targeted aircraft. The F-35A uses defensive flares of magnesium that, when ignited, burn for a short period (less than 5 seconds) at approximately 2,000 degrees Fahrenheit (°F). The burn temperature is hotter than

the F-35A exhaust, so the flare attracts and decoys heat-seeking weapons and sensors targeted on the aircraft. Pilots must train regularly with defensive flares under simulated threat conditions to ensure flare deployment in extremely high stress combat conditions.

The F-35A is expected to use the Mobile Jettison Unit (MJU)-61/B training flares. It is similar to the M-206 and MJU-7/B flares currently used in the training airspace by legacy aircraft. Table 2–11 describes all three flares for comparison.

Flares are used only in approved airspace at altitudes designated for the airspace. Flares burn out in approximately 500 feet, so altitude restrictions in special use airspace are established to insure flare burnout before a flare reaches the ground or water surface under the training airspace.

The MJU-61/B flare is the same size as the M-206 flare. Each flare is approximately 1.0 inch x 1.0 inch x 8.1 inches long. The difference is that the MJU-61/B flare has an igniter device which allows the hot gasses propelling the flare from the aluminum cartridge to ignite the flare magnesium pellet as the flare exits the cartridge. The M-206 initiates flare ignition while the flare magnesium pellet is still in the aluminum cartridge. After a flare is deployed, residual materials fall to the ground. The MJU-7/B flare is approximately 2.0 inches x 1.0 inch x 8.1 inches long and includes a Safe and Initiation (S&I) device, which permits the flare to ignite as it exits the cartridge. Table 2–11 presents the residual materials deposited on the ground following deployment of each MJU-61/B, M-206, and MJU-7/B flare.

Table 2–11. Residual Material Deposited on the Ground Following Deployment of One Flare

		Flare Type		
Material	**Disposition**	**MJU-61/B**	**M-206**	**MJU-7/B**
Flare Case	Aluminum, remains in aircraft	1 inch × 1 inch × 8 inches	1 inch × 1 inch × 8 inches	2 inch × 1 inch × 8 inches
Flare Insert	Burns when deployed	Magnesium, Teflon	Magnesium, Teflon	Magnesium, Teflon
End Cap/Pad	Deposited on the ground	One 1 inch × 1 inch × 1/8 inch plastic or nylon; one same sized silicone foam pad	One 1 inch × 1 inch × 1/8 inch plastic or nylon; one same sized silicone foam pad	One 2 inch × 1 inch × 1/8 inch plastic or nylon; one same sized silicone foam pad
Piston	Deposited on the ground	One 1 inch × 1 inch × 1/2 inch nylon/plastic	One 1 inch × 1 inch × 1/2 inch nylon/plastic	One 2 inch × 1 inch × 1/2 inch nylon/plastic
Flare/Body Wrapping	Deposited on the ground	One up to 2 inch × 17 inch piece of graphite fabric stiff duct-tape type material	One up to 2 inch × 17 inch piece of graphite fabric stiff duct-tape type material	One up to 3 inch x 17 inch piece of graphite fabric stiff duct-tape type material
Initiator or S&I Device	Deposited on the ground	One 1 inch × 1 inch × 1/2 inch plastic/spring device	None	One 2 inch × 1 inch × 1/2 inch plastic/ spring device

Different flare residual materials have different rates of descent and different impacts when they reach the ground. All of the MJU-61/B and M-206 residual flare materials that fall have surface area to weight ratios that would not produce any substantial impact when the residual flare material struck the ground. The largest item is the 0.975 inch × 0.975 inch × 0.5 inch plastic and spring igniter device with a weight of approximately 0.33 ounces in the MJU-61/B flare. This igniter device would strike the ground with a momentum of 0.046 lb-sec, or approximately the same force as a small hailstone. The MJU-7/B has the largest piece of residual material, the S&I device, which would strike the ground with a momentum of 0.16 lb-sec, or approximately the same force as a large hailstone. If an igniter device were to strike an unprotected individual, it would be expected to be noticed, but not cause a bruise. An S&I device could cause a bruise. The likelihood of a strike would depend upon the number of flares deployed, the areal extent of the airspace, the population density under the airspace, and the proportion of time a person would be expected to be outside. Assuming a remote, rural area with a population density of 5 persons per square mile and, from Table 2–10 for the 72 aircraft scenario, 79,200 flares deployed per year in a MOA over a 2,000-square-mile area, the potential strike from a small or large hailstone sized flare residual piece has been calculated as 0.00554 strikes per year, or approximately six strikes in 1,000 years of training.

F-35A training flare residual pieces would not be likely to strike a person, and the pieces would fall with a force that would not be expected to result in a serious injury even if a person were struck. Once on the ground, the residual materials would degrade slowly as would any plastic or nylon materials. If a nylon/plastic or other piece of flare residual material were found on the ground, and identified, the finding individual could be annoyed.

Flares are tested to ensure they meet performance requirements in terms of ejection, ignition, and effective radiant intensity. The flare procurement specifications require that a flare-manufactured lot of several thousand flares pass the ignition and ejection test where a random sample of 80 flares is drawn from the manufactured lot of several thousand flares (lot size can vary with flare type). The 80 flares are tested, and a failure of one or two flares would be acceptable, but three malfunctioning flares out of the 80 would result in the entire flare manufactured lot being rejected. If the number of failures exceeds the upper control quality assurance acceptance level (approximately 99 percent must be judged reliable for ejection, ignition, and intensity), the flares are returned to the manufacturer.

Malfunction of approximately one percent of the flares is defined in one of four ways. One would be if the flare was electrically triggered but did not release and did not burn. Such a flare would be treated as unexploded ordnance when the aircraft returned to the base and the unused flare would be removed for disposal. A second type of malfunction would be if the flare burned but did not release from the aircraft. This would be an extremely dangerous situation for the pilot. There is only one recorded case of this occurring. In 1980, an F-102 fighter aircraft was destroyed and the pilot ejected. Reliability of flare ignition and deployment has been substantially improved since 1980. A third type of malfunction would be a flare that is released at too low an altitude or a flare that did not burn correctly. If a burning flare struck the ground, it could result in a fire, with potential environmental consequences. The design, manufacturing, and testing process makes it extremely unlikely that a flare would burn for a period of time substantially longer than required for the decoy purpose. Pilots have been known to release a flare accidentally at too low an altitude when training during simulated

combat conditions. In an 18-month study performed at a variety of military airspaces where Air Force aircraft deployed an estimated 350,000 flares training during the period, there were 7 fires attributed to flares. This calculates to an average likelihood that a flare could cause a fire under airspace treated as a military training range of 0.00002. During that 18-month period, there were no reported cases of fires in MOAs outside of airspace treated as a military range (U.S. Air Force Updated 1998).

The fourth type of malfunction would be if a flare were released from the aircraft but did not burn, in either whole or in part, and became a dud flare on the ground. In military ranges where approximately 200,000 flares had been deployed, an average of 18 duds was found on the ground per year during annual explosive ordnance clean up. This calculates to a flare malfunction producing a dud flare ratio of approximately 1 in 10,000.

A dud flare would probably not ignite even in a campfire unless it was on a very hot bed of coals. If a dud flare were shot with a bullet or cut with a power saw, the friction could cause it to ignite. If a dud flare were struck by an ax, it is unlikely, but possible, that an ignition could occur. Should a flare be ignited, it would burn at a temperature of 2,000 °F and could result in severe injury or death.

The likelihood of finding a dud flare is extremely remote, and the likelihood of a dud flare igniting is even more remote, but because there would be dud flares on the ground under the airspace, someone has the potential to come upon one. The message is: do not touch it; tell a local fire department about its location.

Effective use of flares in combat requires frequent training by aircrews to master the timing of deployment and the capabilities of the defensive countermeasure and by ground crews to ensure safe and efficient handling of flares. Defensive countermeasures deployment in authorized airspace is governed by a series of policies and regulations based on safety, environmental considerations, and defensive countermeasures limitations. These policies and regulations establish procedures governing the use of flares over ranges, other government-owned and -controlled lands, and nongovernment-owned or -controlled areas. Additional environmental analysis would be needed prior to employing flares other than the MJU-61/B, M-206, or MJU-7/B outside an airspace where training is currently approved for such flares or the MJU-10/B, which has the same S&I residual piece as the MJU-7/B.

2.5 No Action Alternative

Section 1502.14(d) of NEPA (42 U.S.C. 4321 et seq.) requires an EIS to analyze the No Action Alternative. No action for this EIS means that an F-35A training basing would not take place. No F-35A personnel changes or construction would be performed and no F-35A training activities would be conducted.

At each potential alternative location, there are ongoing and currently planned activities and programs that would continue whether or not the location is chosen for the basing of an F-35A PTC; these ongoing and planned activities are included as part of the baseline conditions. For the purpose of this EIS, the No Action Alternative constitutes the baseline conditions at each alternative location.

2.6 Preferred Alternative

The Air Force identified Luke AFB with 72 F-35A training aircraft as the Air Force's Preferred Alternative in accordance with Title 40 of the *Code of Federal Regulations* (CFR), Section 1502.14(e). A preferred alternative is an alternative that the Air Force believes best fulfills its mission and responsibilities, taking into consideration environmental, operational, technical, and other factors. This EIS analyzes up to 144 F-35A aircraft at Luke AFB.

2.7 Comparison of Environmental Consequences

This summary of environmental consequences is designed to provide an overview for the public, as well as Air Force decisionmakers who will be selecting a basing location for the F-35A training mission. The following NEPA activities have been completed to ensure that decisionmakers have a comprehensive understanding of the potential environmental consequences of their decision:

- Extensive scoping, with multiple public meetings, conducted over a 5-month period, with public and agency input during scoping identifying important environmental resources.
- Detailed discussion with Air Force and contractor personnel who are developing, testing, and will train to fly the F-35A. These inputs became the specifics that describe the alternatives and provide the detail on how the F-35A would fit at each base and potentially affect local and regional environmental resources.
- Documentation of existing environmental conditions for each candidate base. The existing conditions for these resources relied heavily on recent environmental materials and Federal and state databases prepared at and near each base.
- Base-specific assessments of environmental consequences of the beddown of the F-35A training mission. Each assessment overlaid the project details upon the existing conditions to estimate potential base-specific environmental consequences. The public and agencies expressed a desire to see a direct relationship between a project action and potential environmental consequence. The Draft EIS responded to that desire by presenting the resource for each base, followed by a direct explanation of the potential environmental consequences to that resource.
- Extensive public and agency review of the Draft EIS over a 54-day period, including 13 public hearings in three states.
- Distribution of this Final EIS, which includes all public and agency comments. Chapter 2 explains the elements of this project. Chapter 3 presents a definition of environmental resources that could potentially be affected by the Proposed Action and the methodology used to evaluate the potential impacts. Chapter 4 contains the analyses of potential environmental consequences at each alternative base.

Table 2–12 in this section presents a summary of the results of the environmental analyses for each base from Chapter 4 in a side-by-side format suited for comparative analysis of the alternatives.

Table 2–12. Comparative Summary of Environmental Consequences

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Airspace Management and Use (Corresponds with Chapter 4, Base-Specific Sections 3.1)				
Base • Operational increases resulting from all basing scenarios could be accommodated by the current air traffic management system within existing airspace without adverse impacts.	Base • Operational increases resulting from all basing scenarios could be accommodated by the current air traffic management system within existing airspace without adverse impacts.	Base • Operational increases resulting from all basing scenarios could be accommodated by the current air traffic management system within existing airspace without adverse impacts.	Base • Operational increases resulting from all basing scenarios could be accommodated by the current air traffic management system within existing airspace without adverse impacts.	Base • Operational increases resulting from Scenarios T1 and T2 could be accommodated by the current air traffic management system within existing airspace without adverse impacts. Under Scenario T3, the projected annual military airfield operations would exceed the maximum number allowed as per agreement with the Tucson Airport Authority. The agreement would need to be renegotiated to allow for additional airfield operations.
Airspace • No modifications would be required for airspace structure or airport flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected. Detailed scheduling and prioritization would continue to be required between the respective scheduling agencies to help ensure all training and other mission requirements are met.	Airspace • No modifications would be required for airspace structure or airfield flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected. Procedures and processes currently being implemented to improve scheduling for this airspace to meet all testing, training, and other operational needs would be used to ensure all organizational requirements are met.	Airspace • No modifications would be required for airspace structure or airfield flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected. Procedures and processes currently being implemented to improve scheduling for this airspace to meet all testing, training, and other operational needs would be used to ensure all organizational requirements are met.	Airspace • No modifications would be required for airspace structure or airfield flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected.	Airspace • No modifications would be required for airspace structure or airport flight patterns and procedures to accommodate the F-35A aircraft operations regardless of the scenario selected.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Noise (Corresponds with Chapter 4, Base-Specific Sections 3.2)				
Base Additional Annoyance: • Off-installation/airport residents affected by ≥65 decibels (dB) day–night average sound level (DNL) would increase from 142 to 3,104; 5,470; and 10,119 persons, or, with mitigations, to 2,547; 3,956; and 5,886 persons, under Scenarios B1, B2, and B3, respectively. • Off-installation acres affected by ≥65 dB DNL would increase from 89 to 3,032; 5,038; and 6,958 acres under Scenarios B1, B2, and B3, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would increase by a factor of 4, 8, and 11 relative to baseline conditions under Scenarios B1, B2, and B3, respectively, at locations studied with windows closed.	Base Additional Annoyance: • Off-installation residents affected by ≥65 dB DNL would decrease by approximately 1 person under Scenarios H1W, H2W, and H3W. • Off-installation acres affected by ≥65 dB DNL would increase from 7,307 to 9,304; 10,880; and 12,283 acres under Scenarios H1W, H2W, and H3W, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would increase by 8%, 20%, and 35% under Scenarios H1W, H2W, and H3W, respectively, at locations studied with windows closed.	Base Additional Annoyance: • Off-installation residents affected by ≥65 dB DNL would decrease by approximately 5 persons under Scenarios H1, H2, H3, H4, and H5. • Off-installation acres affected by ≥65 dB DNL would decrease under Scenario H1. Under Scenarios H2, H3, H4, and H5, off-installation acres exposed to ≥65 dB DNL would increase from 7,307 to 8,025; 9,438; 10,721; and 11,833 acres, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would decrease under Scenarios H1 and H2, but would increase by 5%, 22%, and 39% under Scenarios H3, H4, and H5, respectively, at locations studied with windows closed.	Base Additional Annoyance: • Off-installation residents affected by ≥65 dB DNL would decrease under Scenarios L1, L2, and L3, but would increase from 1,601 to 2,223; 3,216; and 5,340 persons under Scenarios L4, L5, and L6, respectively. • Off-installation acres affected by ≥65 dB DNL would decrease under Scenarios L1 and L2, but would increase from 7,042 to 7,916; 9,398; 10,679; and 11,651 acres under Scenarios L3, L4, L5, and L6, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would decrease under Scenarios L1, L2, and L3, but would increase by 22%, 44%, and 71% under Scenarios L4, L5, and L6, respectively, at locations studied with windows closed.	Base Additional Annoyance: • Off-installation/airport residents affected by ≥65 dB DNL would increase from 407 to 1,918; 4,378; and 8,534 persons under Scenarios T1, T2, and T3, respectively. • Off-installation/airport acres affected by ≥65 dB DNL would increase from 500 to 1,200; 1,942; and 2,938 acres under Scenarios T1, T2, and T3, respectively. Speech Interference: • Cumulative average events per daytime hour with potential to interfere with speech would increase by 11%, 92%, and 172% under Scenarios T1, T2, and T3, respectively, at locations studied with windows closed.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Noise (Corresponds with Chapter 4, Base-Specific Sections 3.2) Base *continued*				
Classroom Impacts: • American National Standards Institute (ANSI) standards for new school construction may not be met at 1, 2, and 4 of the 4 schools studied under Scenarios B1, B2, and B3, respectively. Sleep Disturbance: • Cumulative average percentage of persons awakened at least once per night among all locations studied with windows closed would increase by 33%, 17%, and 31% under Scenarios B1, B2, and B3, respectively. Potential Hearing Loss: • Off-installation/airport residents affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) would increase from 0 to 68, 164, and 313 persons under Scenarios B1, B2, and B3, respectively. • No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.	Classroom Impacts: • ANSI standards for new school construction may not be met at either of the 2 schools studied under any scenario or under baseline conditions. Sleep Disturbance: • Cumulative average percentage of persons awakened at least once per night among all locations studied with windows closed would decrease or remain the same under all scenarios. Potential Hearing Loss: • No off-installation residents would be affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) under any scenario. • No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.	Classroom Impacts: • ANSI standards for new school construction may not be met at either of the 2 schools studied under any scenario or under baseline conditions. Sleep Disturbance: • Cumulative average percentage of persons awakened at least once per night among all locations studied with windows closed would decrease under all scenarios. Potential Hearing Loss: • No off-installation residents would be affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) under any scenario. • No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.	Classroom Impacts: • ANSI standards for new school construction may not be met at 1 of the 5 schools studied under Scenarios L1 and L2, at 2 schools under Scenario L3, and at 3 schools under Scenarios L4, L5, and L6. Sleep Disturbance: • Cumulative average percentage of persons awakened at least once per night averaged among all locations studied with windows closed would decrease under all scenarios. Potential Hearing Loss: • Off-installation/airport residents affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) would decrease under Scenarios L1 and L2, but would increase from 2 to 5, 8, 12, and 14 persons under Scenarios L3, L4, L5, and L6, respectively. • No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.	Classroom Impacts: • ANSI standards for new school construction may not be met at 1, 2, and 4 of the 5 schools studied under Scenarios T1, T2, and T3, respectively. Sleep Disturbance: • Cumulative average percentage of persons awakened at least once per night among all locations studied with windows closed would increase by 16% under Scenarios T1 and T2 and by 23% under Scenario T3. Potential Hearing Loss: • No off-installation residents would be affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) under any scenario. • No on-installation residents would be affected at levels ≥80 dB DNL under any scenario.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Noise (Corresponds with Chapter 4, Base-Specific Sections 3.2) *continued*				
Airspace Subsonic Noise: • The onset rate-adjusted monthly day–night average sound level (DNL_{mr}) beneath Special Use Airspaces (SUAs) would increase by up to 5, 7, and 9 dB under Scenarios B1, B2, and B3, respectively, but would equal or exceed 65 dB only beneath Jarbidge North and Owyhee Military Operations Areas (MOAs), Restricted Area 3202 (R-3202), and R-3204 under Scenarios B1, B2, and B3. • DNL_{mr} beneath Military Training Routes (MTRs) would increase between 3 and 5 dB under Scenarios B1, B2, and B3, respectively, and would exceed 65 dB under Instrument Route (IR)-301/307 and IR-392/305 under all three F-35A scenarios. • Beneath the MOA/Air Traffic Control Assigned Airspace (ATCAA) or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in Section 3.2 could increase from 12 to up to 17 percent with Scenario B3.	Airspace Subsonic Noise: • DNL_{mr} beneath SUAs would increase by up to 5, 8, and 9 dB under Scenarios H1W, H2W, and H3W, respectively. DNL_{mr} would equal or exceed 65 dB beneath Red Rio and Oscura Range airspace units under Scenarios H2W and H3W, as well as beneath Yonder airspace under Scenario H3W. • DNL_{mr} beneath MTRs would increase by up to 3, 4, and 5 dB under Scenarios H1W, H2W, and H3W, respectively, but would not exceed 65 dB under any scenario. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in Section 3.2 could increase from 5 to up to 13 percent with Scenario H3W.	Airspace Subsonic Noise: • DNL_{mr} beneath SUAs would increase by up to 4, 7, 9, 10, and 11 dB under Scenarios H1, H2, H3, H4, and H5, respectively, and would equal or exceed 65 dB under 0, 0, 3, 5, and 6 of the 11 primary use SUAs under Scenarios H1, H2, H3, H4, and H5, respectively. • DNL_{mr} beneath MTRs would increase by up to 3, 4, 5, 6, and 7 dB under Scenarios H1, H2, H3, H4, and H5, respectively, but would not exceed 65 dB under any scenario. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in Section 3.2 could increase from 5 to up to 17 percent with Scenario H5.	Airspace Subsonic Noise: • DNL_{mr} beneath SUAs would increase by up to 3, 6, 7, 9, 10, and 10 dB under Scenarios L1, L2, L3, L4, L5, and L6, respectively, and would exceed 65 dB beneath 0, 2, 3, 3, 4, and 4 of the 6 primary use SUAs under Scenarios L1, L2, L3, L4, L5, and L6, respectively. • DNL_{mr} beneath MTRs would increase by up to 11, 14, 16, 17, 18, and 19 dB under Scenarios L1, L2, L3, L4, L5, and L6, respectively, but would not exceed 65 dB under any scenario. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in Section 3.2 could increase from 7 to up to 21 percent with Scenario L6.	Airspace Subsonic Noise: • DNL_{mr} beneath SUAs would increase by up to 3, 6, and 8 dB under Scenarios T1, T2, and T3, respectively, but would not exceed 65 dB under any scenario. • DNL_{mr} beneath the primary use MTR would increase by 11, 14, and 16 dB under Scenarios T1, T2, and T3, respectively, but would not exceed 65 dB under any scenario. • Beneath the MOA/ATCAA or MTR with the highest DNL_{mr} under a beddown scenario, the percentage of the population highly annoyed estimated using the methods described in Section 3.2 could increase from 7 to up to 11 percent with Scenario T3.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Noise (Corresponds with Chapter 4, Base-Specific Sections 3.2) Airspace *continued*				
Supersonic Noise: • The C-weighted day–night average sound level (CDNL) would increase by 1 dB or less beneath primary training SUAs in which supersonic training is allowed. • Average number of sonic booms would increase by <1 per day. Munitions Noise: • F-35A would conduct inert weapons training at Saylor Creek and Juniper Butte Ranges. Inert bombs generate minimal noise. Live weapons training would be conducted at Utah Test and Training Range (UTTR). Increases in munitions noise levels at UTTR would not be expected to be noticeable in the context of ongoing munitions testing and training.	Supersonic Noise: • CDNL would increase by 2 dB or less beneath primary training SUAs in which supersonic training is allowed. • Average number of sonic booms would increase by <1 per day. Munitions Noise: • F-35A would conduct munitions training with live and inert munitions at Red Rio, Centennial, and Oscura Ranges. Noise generated by live munitions usage may be audible in off-range locations, but would be relatively infrequent.	Supersonic Noise: • CDNL would decrease beneath all primary training SUAs in which supersonic training is allowed, except beneath McGregor Range airspace units, where it would increase by up to 3 dB. • Average number of sonic booms would increase by <1 per day or decrease. Munitions Noise: • F-35A would conduct munitions training with live and inert munitions at Red Rio, Centennial, and Oscura Ranges. Noise generated by live munitions usage may be audible in off-range locations, but would be relatively infrequent.	Supersonic Noise: • CDNL would decrease beneath all primary training SUAs in which supersonic training is allowed. • Average number of sonic booms per day would decrease or remain the same under all scenarios. Munitions Noise: • F-35A would conduct munitions training with live and inert munitions at Barry M. Goldwater Range (BMGR). Noise generated by live munitions usage may be audible in off-range locations, but would be relatively infrequent.	Supersonic Noise: • CDNL would decrease beneath all primary training SUAs in which supersonic training is allowed. • Average number of sonic booms per day would decrease beneath all primary training SUAs. Munitions Noise: • F-35A would conduct munitions training with live and inert munitions at BMGR. Noise generated by live munitions usage may be audible in off-range locations, but would be relatively infrequent.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Noise (Corresponds with Chapter 4, Base-Specific Sections 3.2) Airspace *continued*				
Auxiliary Airfield (Mountain Home AFB): • Off-installation/airport residents affected by ≥65 dB DNL would increase from 10 to 11 persons under Scenario B1 and to 12 persons under Scenarios B2 and B3. • Off-installation/airport acres affected by ≥65 dB DNL would increase from 13,658 to 14,293; 14,935; and 15,602 acres under Scenarios B1, B2, and B3, respectively.	Auxiliary Airfield (Roswell International Air Center [RIAC]): • The approximate number of residents affected by ≥65 dB DNL would increase from 61 to 169, 255, and 358 persons under Scenarios H1W, H2W, and H3W, respectively. • The number of acres affected by ≥65 dB DNL would increase from 3,703 to 4,484; 5,117; and 5,676 acres under Scenarios H1W, H2W, and H3W, respectively. Auxiliary Airfield (Biggs Army Airfield [Biggs AAF]): • Off-installation/airport residents affected by ≥65 dB DNL would increase from 638 to 667, 701, and 736 persons under Scenarios H1W, H2W, and H3W, respectively. • Off-installation/airport acres affected by ≥65 dB DNL would increase by 2, 5, and 8 acres under Scenarios H1W, H2W, and H3W, respectively.	Auxiliary Airfield (RIAC): • The approximate number of residents affected by ≥65 dB DNL would increase from 61 to 66, 164, 247, 368, and 558 persons under Scenarios H1, H2, H3, H4, and H5, respectively. • The number of acres affected by ≥65 dB DNL would increase from 3,703 to 3,426; 4,138; 4,745; 5,295; and 5,805 acres under Scenarios H1, H2, H3, H4, and H5, respectively. Auxiliary Airfield (Biggs AAF): • Impacts would be the same under Scenarios H1, H2, and H3 as under Scenarios H1W, H2W, and H3W. • Off-installation/airport residents affected by ≥65 dB DNL would increase from 638 to 769 and 786 persons under Scenarios H4 and H5, respectively. • Off-installation/airport acres affected by ≥65 dB DNL would increase by 11 and 13 acres under Scenarios H4 and H5, respectively.	Auxiliary Airfield (Gila Bend Air Force Auxiliary Field [Gila Bend AFAF]): • Off-installation residents affected by ≥65 dB DNL would decrease under Scenario L1, but would increase from 3 to 5, 9, 11, 13, and 15 persons under Scenarios L2, L3, L4, L5, and L6, respectively. • Off-installation acres affected by ≥65 dB DNL would increase from 1,313 to 1,559; 2,497; 3,294; 3,995; 4,623; and 5,177 acres under Scenarios L1, L2, L3, L4, L5, and L6, respectively. Auxiliary Airfield (Luke AFB Auxiliary Airfield 1 [Aux-1]): • Off-installation residents affected by ≥65 dB DNL would decrease under Scenarios L1, L2, L3, L4, and L5, but would increase under Scenario L6 from 710 to 802 persons. • Off-installation acres affected by ≥65 dB DNL would decrease under all scenarios.	Auxiliary Airfield (Libby Army Airfield [Libby AAF]): • No off-installation residents would be affected by ≥65 dB DNL under any scenario. • Off-installation area affected by ≥65 dB DNL would be limited to land owned by the Sierra Vista Municipal Airport.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Noise (Corresponds with Chapter 4, Base-Specific Sections 3.2) Airspace *continued*				
	Auxiliary Airfield (El Paso International Airport [EPIA]): • Off-installation/airport residents affected by ≥65 dB DNL would increase from 1,295 to 1,643; 2,241; and 2,590 persons under Scenarios H1W, H2W, and H3W, respectively. • Off-installation/airport acres affected by ≥65 dB DNL would increase from 1,201 to 1,388; 1,526; and 1,648 acres under Scenarios H1W, H2W, and H3W, respectively.	Auxiliary Airfield (EPIA): • Impacts would be the same under Scenarios H1, H2, and H3 as under Scenarios H1W, H2W, and H3W. • Off-installation/airport residents affected by ≥65 dB DNL would increase from 1,295 under Scenario H1 to 2,857 and 3,179 persons under Scenarios H4 and H5, respectively. • Off-installation/airport acres affected by ≥65 dB DNL would increase from 1,201 under Scenario H1 to 1,768 and 1,887 acres under Scenarios H4 and H5, respectively.	Auxiliary Airfield (Luke AFB Auxiliary Airfield 1 [Aux-1]) *continued*: • Off-installation/airport residents affected by noise levels at which the risk of hearing loss is considered to be substantial (≥80 dB DNL) would increase from 4 to 10, 15, 18, 21, 23, and 26 persons under Scenarios L1, L2, L3, L4, L5, and L6, respectively.	
Air Quality (Corresponds with Chapter 4, Base-Specific Sections 3.3)				
Base • Construction activities would produce annual emissions that would remain well below any conformity or Prevention of Significant Deterioration (PSD) threshold (100 or 250 tons per year, depending on the pollutant). Therefore, proposed construction emissions would produce less than significant air quality impacts.	Base • Construction activities would produce annual emissions that would remain well below any PSD threshold (250 tons per year). Therefore, proposed construction emissions would produce less than significant air quality impacts.	Base • Construction activities would produce annual emissions that would remain well below any PSD threshold (250 tons per year). Therefore, proposed construction emissions would produce less than significant air quality impacts.	Base • Construction activities would produce annual emissions that would remain well below any conformity or PSD threshold (70, 100, or 250 tons per year, depending on the pollutant). Therefore, proposed construction emissions would produce less than significant air quality impacts.	Base • Construction activities would produce annual emissions that would remain well below any conformity or PSD threshold (100 or 250 tons per year, depending on the pollutant). Therefore, proposed construction emissions would produce less than significant air quality impacts.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Air Quality (Corresponds with Chapter 4, Base-Specific Sections 3.3) Base *continued*				
• The increase in emissions under Scenario B3 would exceed the applicable carbon monoxide (CO) conformity threshold. All other emission increases from the three basing scenarios would not exceed any applicable conformity or PSD significance threshold and would produce less than significant air quality impacts at Boise AGS. • In regard to proposed CO emissions that would exceed the conformity threshold of 100 tons per year under Scenario B3, the U.S. Air Force (Air Force) would apply one or more of the criteria under Title 40 of the *Code of Federal Regulations* (CFR), Section 93.158(a), to make a positive final general conformity determination. Therefore, this analysis would demonstrate that proposed CO emission increases under this scenario would not contribute to an exceedance of a National Ambient Air Quality Standard (NAAQS).	• The increase in CO emissions under Scenario H3W would exceed the PSD threshold of 250 tons per year. All other emission increases from the three basing scenarios would not exceed any PSD significance threshold and would produce less than significant air quality impacts at Holloman AFB. • Further evaluation of CO emission increases under Scenario H3W determined that these emissions would not contribute to an exceedance of an ambient air quality standard within the Otero County project region. Therefore, CO emissions from the basing actions at Holloman AFB would produce less than significant impacts.	• The increase in emissions under Scenarios H1 through H5 would not exceed the PSD threshold of 250 tons per year. As a result, all F-35A basing scenarios would produce less than significant air quality impacts at Holloman AFB.	• Each F-35A basing scenario would reduce emissions of all pollutants. Since no basing scenario would exceed any applicable conformity or PSD threshold, these actions would produce less than significant air quality impacts at Luke AFB.	• Each F-35A basing scenario would reduce emissions of all pollutants, except Scenarios T2 and T3 would increase emissions of nitrogen oxides (NO_X). No emission increases under the three basing scenarios at Tucson AGS would exceed any applicable conformity or PSD threshold. Therefore, operation of 72 F-35A aircraft would produce less than significant air quality impacts at Tucson AGS. • Projected F-35A operations within the Tucson AGS project region would produce less than significant contributions to visibility impairment within nearby Class I areas.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Air Quality (Corresponds with Chapter 4, Base-Specific Sections 3.3) *continued*				
Airspace • The increase in operational emissions under Scenario B3 within proposed airspaces would exceed the NO_X PSD threshold of 250 tons per year. All other emission increases under the three basing scenarios would not exceed any PSD or conformity threshold and would produce less than significant impacts on NAAQS pollutant levels within the Boise AGS airspace project region. Further evaluation of the NO_X emission increases under Scenario B3 determined that these emissions would not contribute to an exceedance of an ambient air quality standard within the airspace project region. As a result, emissions of NO_X from F-35A operations within proposed Boise AGS airspace units would produce less than significant impacts on NAAQS pollutant levels.	Airspace • The increase in operational emissions under Scenario H3W within proposed airspaces would exceed the NO_X PSD threshold of 250 tons per year. All other emission increases under the three basing scenarios would not exceed any PSD threshold and would produce less than significant impacts on NAAQS pollutant levels within proposed Holloman AFB airspace units. • Further evaluation of the NO_X emission increases under Scenario H3W determined that these emissions would not contribute to an exceedance of an ambient air quality standard within the airspace project region. As a result, emissions of NO_X from F-35A operations within proposed airspace units would produce less than significant impacts on NAAQS pollutant levels.	Airspace • The increase in operational emissions under Scenarios H4 and H5 within proposed airspaces would exceed the NO_X PSD threshold of 250 tons per year. All other emission increases under the five basing scenarios would not exceed any PSD threshold and would produce less than significant impacts on NAAQS pollutant levels within proposed Holloman AFB airspace units. • Further evaluation of the NO_X emission increases under Scenarios H4 and H5 determined that these emissions would not contribute to an exceedance of an ambient air quality standard within the airspace project region. As a result, emissions of NO_X from F-35A operations within proposed airspace units would produce less than significant impacts on NAAQS pollutant levels.	Airspace • Operation of all F-35A aircraft basing scenarios in proposed airspaces would reduce emissions of all pollutants from current F-16 levels, except Scenario L6 would produce a nominal increase in emissions of SO_2. As a result, emissions from these scenarios would not exceed any applicable conformity or PSD threshold. Therefore, F-35A operations within the proposed Luke AFB airspace units would produce less than significant impacts on NAAQS pollutant levels. • Since the operation of F-35A aircraft within proposed airspace units would decrease emissions from current F-16 levels for all basing scenarios or would only produce a nominal increase of SO_2 emissions under Scenario L6, these actions would produce less than significant contributions to visibility impairment within the regional Class I areas.	Airspace • Operation of all F-35A aircraft basing scenarios within the Tucson AGS airspaces would reduce emissions of all pollutants from current F-16 levels and as a result would not exceed any applicable conformity or PSD threshold. Therefore, proposed F-35A operations within the Tucson AGS airspace units would produce less than significant impacts on NAAQS pollutant levels. • Since the operation of F-35A aircraft within proposed airspaces would decrease emissions from current F-16 levels for all Tucson AGS basing scenarios, these actions would produce less than significant contributions to visibility impairment within the regional Class I areas.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Air Quality (Corresponds with Chapter 4, Base-Specific Sections 3.3) Airspace *continued*				
• F-35A operations within proposed airspace units would impact the Jarbidge Wilderness Area in northern Nevada more than any other pristine Class I area. Proposed F-35A operations would not substantially contribute to visibility impairment within the Jarbidge Wilderness Area. Therefore, proposed F-35A operations within the Boise AGS airspace units would produce less than significant contributions to visibility impairment within all Class I areas in the project region.	• F-35A operations within proposed airspaces would impact the Bosque del Apache Wilderness Area (BAWA) in central New Mexico more than any other pristine Class I area. Proposed F-35A operations would not substantially contribute to visibility impairment within the BAWA. Therefore, proposed F-35A operations within the Holloman AFB airspace units would produce less than significant contributions to visibility impairment within all Class I areas in the project region.	• F-35A operations within proposed airspace units would impact the BAWA in central New Mexico more than any other pristine Class I area. Proposed F-35A operations would not substantially contribute to visibility impairment within the BAWA. Therefore, proposed F-35A operations within the Holloman AFB airspace units would produce less than significant contributions to visibility impairment within all Class I areas in the project region.		

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Safety (Corresponds with Chapter 4, Base-Specific Sections 3.4)				
Base • No change in operations and maintenance procedures from current levels. All activities would be conducted in accordance with applicable regulations, technical orders, and Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) standards. • F-35A-related construction, renovation, or infrastructure improvements would not take place in established quantity-distance (Q-D) arcs and would comply with all Occupational Safety and Health Administration (OSHA) regulations. • Ordnance would continue to be handled in accordance with Air Force and Department of Defense Explosives Safety Board (DDESB) directives and carried out by trained personnel. • An estimated 108 flights per year would use Mountain Home AFB for live weapons loading as is currently done for Boise AGS-based A-10s.	Base • No change in operations and maintenance procedures from current levels. All activities would be conducted in accordance with applicable regulations, technical orders, and AFOSH standards. • F-35A-related construction, renovation, or infrastructure improvements would not take place in established Q-D arcs or Accident Potential Zones (APZs) and would comply with all Anti-Terrorism/ Force Protection (AT/FP) requirements and OSHA regulations. • Ordnance would continue to be handled in accordance with Air Force and DDESB directives and carried out by trained personnel. • As F-35A becomes operationally mature, the aircraft mishap rate is expected to become comparable with similarly sized aircraft with a similar mission. The Class A rate is not yet determined for the F-35A, and, as with any new aircraft, there are always elements of a new system that require testing. Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location.	Base • No change in operations and maintenance procedures from current levels. All activities would be conducted in accordance with applicable regulations, technical orders, and AFOSH standards. • F-35A-related construction, renovation, or infrastructure improvements would not take place in established Q-D arcs or APZs and would comply with all AT/FP requirements and OSHA regulations. • Ordnance would continue to be handled in accordance with Air Force and DDESB directives and carried out by trained personnel. • As F-35A becomes operationally mature, the aircraft mishap rate is expected to become comparable with similarly sized aircraft with a similar mission. The Class A rate is not yet determined for the F-35A, and, as with any new aircraft, there are always elements of a new system that require testing. Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location.	Base • No change in operations and maintenance procedures from current levels. All activities would be conducted in accordance with applicable regulations, technical orders, and AFOSH standards. • F-35A-related construction, renovation, or infrastructure improvements would not take place in established Q-D arcs or APZs and would comply with all AT/FP requirements and OSHA regulations. • Ordnance would continue to be handled in accordance with Air Force and DDESB directives and carried out by trained personnel. • As F-35A becomes operationally mature, the aircraft mishap rate is expected to become comparable with similarly sized aircraft with a similar mission. The Class A rate is not yet determined for the F-35A, and, as with any new aircraft, there are always elements of a new system that require testing. Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location.	Base • No change in operations and maintenance procedures from current levels. All activities would be conducted in accordance with applicable regulations, technical orders, and AFOSH standards. • F-35A-related construction, renovation, or infrastructure improvements would not take place in established Q-D arcs and would comply with all OSHA regulations. • Ordnance would continue to be handled in accordance with Air Force and DDESB directives and carried out by trained personnel. • An estimated 108 flights per year would use Davis-Monthan AFB for live weapons loading as is currently done for Tucson AGS-based F-16 training aircraft. • As F-35A becomes operationally mature, the aircraft mishap rate is expected to become comparable with similarly sized aircraft with a similar mission. The Class A rate is not yet determined for the F-35A, and, as with any new aircraft, there are always elements of a new system that require testing. Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Safety (Corresponds with Chapter 4, Base-Specific Sections 3.4) Base *continued*				
As F-35A becomes operationally mature, the aircraft mishap rate is expected to become comparable with similarly sized aircraft with a similar mission. The Class A rate is not yet determined for the F-35A, and, as with any new aircraft, there are always elements of a new system that require testing. • Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location. • Emergency and mishap response plans should be updated to include necessary procedures and response actions specific to the F-35A. With these updates, Boise AGS airfield safety conditions would be similar to existing conditions.	• Emergency and mishap response plans should be updated to include necessary procedures and response actions specific to the F-35A. With these updates, Holloman AFB airfield safety conditions would be similar to existing conditions.	• Emergency and mishap response plans should be updated to include necessary procedures and response actions specific to the F-35A. With these updates, Holloman AFB airfield safety conditions would be similar to existing conditions.	• Emergency and mishap response plans should be updated to include necessary procedures and response actions specific to the F-35A. With these updates, Luke AFB airfield safety conditions would be similar to existing conditions.	• Emergency and mishap response plans should be updated to include necessary procedures and response actions specific to the F-35A. With these updates, Tucson AGS airfield safety conditions would be similar to existing conditions.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Safety (Corresponds with Chapter 4, Base-Specific Sections 3.4) Airspace *continued*				
Airspace • F-35A would operate in a similar manner as those aircraft currently using the primary use airspace using the same procedures. No increase in safety risks associated with aircraft mishaps or increase in risk of mishaps is expected. • F-35A is capable of dumping fuel in emergency situations. Fuel dumping during emergency situations would be conducted in accordance with Federal Aviation Administration (FAA) requirements to dump fuel in designated areas and at designated altitudes to improve evaporation and to ensure adequate separation from other air traffic.	Airspace • F-35A would operate in a similar manner as those aircraft currently using the primary use airspace using the same procedures. No increase in safety risks associated with aircraft mishaps or increase in risk of mishaps is expected. • F-35A is capable of dumping fuel in emergency situations. Fuel dumping during emergency situations would be conducted in accordance with FAA requirements to dump fuel in designated areas and at designated altitudes to improve evaporation and to ensure adequate separation from other air traffic.	Airspace • F-35A would operate in a similar manner as those aircraft currently using the primary use airspace using the same procedures. No increase in safety risks associated with aircraft mishaps or increase in risk of mishaps is expected. • F-35A is capable of dumping fuel in emergency situations. Fuel dumping during emergency situations would be conducted in accordance with FAA requirements to dump fuel in designated areas and at designated altitudes to improve evaporation and to ensure adequate separation from other air traffic.	Airspace • F-35A would operate in a similar manner as those aircraft currently using the primary use airspace using the same procedures. No increase in safety risks associated with aircraft mishaps or increase in risk of mishaps is expected. • F-35A is capable of dumping fuel in emergency situations. Fuel dumping during emergency situations would be conducted in accordance with FAA requirements to dump fuel in designated areas and at designated altitudes to improve evaporation and to ensure adequate separation from other air traffic.	Airspace • F-35A would operate in a similar manner as those aircraft currently using the primary use airspace using the same procedures. No increase in safety risks associated with aircraft mishaps or increase in risk of mishaps is expected. • F-35A is capable of dumping fuel in emergency situations. Fuel dumping during emergency situations would be conducted in accordance with FAA requirements to dump fuel in designated areas and at designated altitudes to improve evaporation and to ensure adequate separation from other air traffic.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Safety (Corresponds with Chapter 4, Base-Specific Sections 3.4) Airspace *continued*				
• Use of Avian Hazard Advisory System, the Bird Avoidance Model, and pilot briefings prior to sorties would continue to identify avoidance areas and minimize risks of bird strikes. • No changes to Mountain Home AFB airfield or airspace from F-35A training mission. Flight safety and ground safety conditions would remain unchanged. • Flares are used only in approved airspace at altitudes designated for the airspace. Flares burn out in approximately 500 feet, so altitude restrictions in Special Use Airspace (SUA) are established to ensure flare burnout before a flare reaches the ground or water under the training airspace.	• Use of Avian Hazard Advisory System, the Bird Avoidance Model, and pilot briefings prior to sorties would continue to identify avoidance areas and minimize risks of bird strikes. • RIAC, EPIA, and Biggs AAF have equipment to handle any potential safety issues with F-35A operations. No impacts on flight safety or ground safety are anticipated for these outlying fields. • Flares are used only in approved airspace at altitudes designated for the airspace. Flares burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flare burnout before a flare reaches the ground or water under the training airspace.	• Use of Avian Hazard Advisory System, the Bird Avoidance Model, and pilot briefings prior to sorties would continue to identify avoidance areas and minimize risks of bird strikes. • RIAC, EPIA, and Biggs AAF have equipment to handle any potential safety issues with F-35A operations. No impacts on flight safety or ground safety are anticipated for these outlying fields. • Flares are used only in approved airspace at altitudes designated for the airspace. Flares burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flare burnout before a flare reaches the ground or water under the training airspace.	• Use of Avian Hazard Advisory System, the Bird Avoidance Model, and pilot briefings prior to sorties would continue to identify avoidance areas and minimize risks of bird strikes. • Aux-1 does not have an active runway. APZs and Clear Zones have been established, which could address any potential issues related to aircraft accidents at Aux-1. • Gila Bend AFAF has adequate equipment and personnel to handle any potential safety issues. No impacts on flight safety or ground safety at Gila Bend AFAF are expected. • Flares are used only in approved airspace at altitudes designated for the airspace. Flares burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flare burnout before a flare reaches the ground or water under the training airspace.	• Use of Avian Hazard Advisory System, the Bird Avoidance Model, and pilot briefings prior to sorties would continue to identify avoidance areas and minimize risks of bird strikes. • Libby AAF has adequate equipment to handle any potential safety issues associated with the operations of the F-35A. No impacts on flight safety or ground safety are expected at Libby AAF. • Flares are used only in approved airspace at altitudes designated for the airspace. Flares burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flare burnout before a flare reaches the ground or water under the training airspace.

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Soils and Water (Corresponds with Chapter 4, Base-Specific Sections 3.5)				
Base • Scenario B1, B2, or B3 construction would disturb 36.5, 37.0, or 37.9 acres of previously disturbed areas, respectively. • Since more than 1 acre would be disturbed by construction, a National Pollutant Discharge Elimination System (NPDES) storm water permit would be required. • With proper design and implementation of the Storm Water Pollution Prevention Plan (SWPPP), impacts from erosion and offsite sedimentation would be negligible and significant impacts would not occur. • Implementation of any of the scenarios would not include construction within any designated 100-year floodplain. • The F-35A aircraft scenarios do not include groundwater withdrawals; thus, impacts on groundwater would not occur.	Base • Scenario H1W, H2W, or H3W construction would disturb 80, 84.4, or 88.8 acres of previously disturbed areas, respectively. • Since more than 1 acre would be disturbed by construction, an NPDES storm water permit would be required. • With proper design and implementation of the SWPPP, impacts from erosion and offsite sedimentation would be negligible. Removal of existing pavement, grading, and excavations would expose the moderately to highly erosive soil to potential wind and water erosion, which, in turn, could result in sedimentation of nearby drainages and creeks. However, these soil limitations could be mitigated through standard engineering and modern construction techniques, such that significant impacts would not occur. • Implementation of any of the scenarios would not include construction within any designated 100-year floodplain.	Base • Scenario H1 through H5 construction would disturb between 43.1 and 98.7 acres of previously disturbed areas. • Since more than 1 acre would be disturbed by construction, an NPDES storm water permit would be required. • With proper design and implementation of the SWPPP, impacts from erosion and offsite sedimentation would be negligible. Removal of existing pavement, grading, and excavations would expose the moderately to highly erosive soil to potential wind and water erosion, which, in turn, could result in sedimentation of nearby drainages and creeks. However, these soil limitations could be mitigated through standard engineering and modern construction techniques, such that significant impacts would not occur. • Implementation of any of the scenarios would not include construction within any designated 100-year floodplain.	Base • Scenario L1 through L6 construction would disturb between 15.6 and 22.6 acres of previously disturbed areas. • Since more than 1 acre would be disturbed by construction, an Arizona Pollutant Discharge Elimination System (AZPDES) storm water permit would be required. • With proper design and implementation of the SWPPP, impacts from erosion and offsite sedimentation would be negligible and significant impacts would not occur. • Implementation of any of the scenarios may include construction within the existing designated 100-year floodplain. • The F-35A aircraft scenarios do not include groundwater withdrawals; thus, impacts on groundwater would not occur.	Base • Scenario T1, T2, or T3 construction would disturb 33, 33.4, or 33.6 acres of previously disturbed areas, respectively. • Since more than 1 acre would be disturbed by construction, an AZPDES storm water permit would be required. • With proper design and implementation of the SWPPP, impacts from erosion and offsite sedimentation would be negligible and significant impacts would not occur. • Implementation of any of the scenarios would not include construction within the existing designated 100-year floodplain of Airport Wash. • The F-35A aircraft scenarios do not include groundwater withdrawals; thus, impacts on groundwater would not occur.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Soils and Water (Corresponds with Chapter 4, Base-Specific Sections 3.5) Base *continued*				
Airspace: Not Applicable	• The F-35A aircraft scenarios do not include groundwater withdrawals; thus, impacts on groundwater would not occur. Airspace: Not Applicable	• The F-35A aircraft scenarios do not include groundwater withdrawals; thus, impacts on groundwater would not occur. Airspace: Not Applicable	Airspace: Not Applicable	Airspace: Not Applicable
Vegetation and Wildlife (Corresponds with Chapter 4, Base-Specific Sections 3.6)				
Base • For proposed construction and demolition activities in developed portions, no long-term effects on vegetation and wildlife are anticipated. Measures to control erosion and siltation would be included as part of the project implementation. Revegetation of temporarily disturbed areas would be conducted, as directed by the base, to minimize the potential for continued erosion and dust generation and decrease the duration of temporary habitat loss.	Base • For proposed construction and demolition activities in developed portions, no long-term effects on vegetation and wildlife are anticipated. Measures to control erosion and siltation would be included as part of the project implementation. Revegetation of temporarily disturbed areas would be conducted, as directed by the base, to minimize the potential for continued erosion and dust generation and decrease the duration of temporary habitat loss.	Base • Impacts would be similar to those described in the previous column.	Base • For proposed construction and demolition activities in developed portions of the installation, no long-term effects on vegetation and wildlife are anticipated. Measures to control erosion and siltation would be included as part of the project implementation. Revegetation of temporarily disturbed areas would be conducted, as directed by the base, to minimize the potential for continued erosion and dust generation and decrease the duration of temporary habitat loss.	Base • For proposed construction and demolition activities in developed portions of the installation, no long-term effects on vegetation and wildlife are expected. Measures to control erosion and siltation would be included as part of the project implementation. Revegetation of temporarily disturbed areas would be conducted, as directed by the base, to minimize the potential for continued erosion and dust generation and decrease the duration of temporary habitat loss.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Vegetation and Wildlife (Corresponds with Chapter 4, Base-Specific Sections 3.6) Base *continued*				
• To comply with the Migratory Bird Treaty Act (MBTA) and the U.S. Department of Defense (DoD) Bat Protection Memorandum of Understanding (MOU), surveys would be conducted to assure no habitation by nesting birds or bat species before buildings would be demolished, removed, or renovated. • Noise levels expected as a result of implementing the F-35A aircraft scenarios would be qualitatively similar to the existing noise environment. Wildlife species in the vicinity of Boise AGS live in a military airfield environment and are not expected to be adversely affected by changes in aircraft overflight and noise associated with the F-35A.	• To comply with the MBTA and the DoD Bat Protection MOU, surveys would be conducted to assure no habitation by nesting birds or bat species before buildings would be demolished, removed, or renovated. No effects on vegetation are expected from operations of the F-35As in the vicinity of Holloman AFB. • Noise levels expected as a result of implementing the F-35A aircraft scenarios would be qualitatively similar to the existing noise environment. Wildlife species in the vicinity of Holloman AFB live in a military airfield environment and are not expected to be adversely affected by changes in aircraft overflight and noise associated with the F-35A.		• To comply with the MBTA and the DoD Bat Protection MOU, surveys would be conducted to assure no habitation by nesting birds or bat species before buildings would be demolished, removed, or renovated. • Noise levels in the vicinity of Luke AFB are expected to be qualitatively similar to the existing noise environment. Wildlife species in the vicinity of Luke AFB live in a military airfield environment and are not expected to be adversely affected by changes in aircraft overflight and noise associated with the F-35A.	• To comply with the MBTA and the DoD Bat Protection MOU, surveys would be conducted to assure no habitation by nesting birds or bats before buildings would be demolished, removed, or renovated. • Noise levels expected as a result of implementing the F-35A aircraft scenarios would be qualitatively similar to the existing noise environment. Wildlife species in the vicinity of Tucson AGS live in a military airfield environment and are not expected to be adversely affected by changes in aircraft overflight and noise associated with the F-35A.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Vegetation and Wildlife (Corresponds with Chapter 4, Base-Specific Sections 3.6) *continued*				
Airspace • No new types of impact would be introduced into these areas as a result of the beddown of the F-35A. The sudden visual appearance of the aircraft and onset of noise from a low-level overflight have the potential to startle wildlife. Both the visual appearance and noise levels of aircraft diminish rapidly with increasing altitude. Based on the very low percentage of time spent in low-level flight by F-35As training within the airspace and the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, no significant adverse effects on vegetation or wildlife from overflights or noise are anticipated. • Because sonic booms currently exist in the project airspace, the majority of training flight takes place at altitudes above 10,000 feet above ground level (AGL), and the generally minimal response to sonic booms observed in free ranging wildlife, the incremental increase in sonic booms is not expected to result in a significant impact on wildlife.	Airspace • No new types of impact would be introduced into these areas as a result of the beddown of the F-35A. The sudden visual appearance of the aircraft and onset of noise from a low-level overflight have the potential to startle wildlife. Both the visual appearance and noise levels of aircraft diminish rapidly with increasing altitude. Based on the very low percentage of time spent in low-level flight by F-35As training within the airspace and the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, no significant adverse effects on vegetation or wildlife from overflights or noise are anticipated. • Because sonic booms currently exist in the project airspace, the majority of F-35A training would take place at altitudes above 10,000 feet AGL, and the response to sonic booms observed in free ranging wildlife is generally minimal, the incremental increase in sonic booms is not expected to result in a significant impact on wildlife.	Airspace • Impacts would be similar to those described in the previous column.	Airspace • No new types of impact would be introduced into these areas as a result of the beddown of the F-35A. The sudden visual appearance of the aircraft and onset of noise from a low-level overflight have the potential to startle wildlife. Both the visual appearance and noise levels of aircraft diminish rapidly with increasing altitude. Based on the very low percentage of time spent in low-level flight by F-35As training within the airspace and the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, no significant adverse effects on vegetation or wildlife from overflights or noise are anticipated. • Because sonic booms currently exist in the project airspace, the majority of F-35A training would take place at altitudes above 10,000 feet AGL, and the response to sonic booms observed in free ranging wildlife is generally minimal, the incremental increase in sonic booms is not expected to result in a significant impact on wildlife.	Airspace • No new types of impact would be introduced into these areas as a result of the beddown of the F-35A. The sudden visual appearance of the aircraft and onset of noise from a low-level overflight have the potential to startle wildlife. Both the visual appearance and noise levels of aircraft diminish rapidly with increasing altitude. Based on the very low percentage of time spent in low-level flight by F-35As training within the airspace and the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, no significant adverse effects on vegetation or wildlife from overflights or noise are anticipated. • Under all beddown scenarios, the average number of sonic booms per day would decrease slightly beneath all primary training airspace units. Because sonic booms currently exist in the project airspace, the majority of F-35A training would take place at altitudes above 10,000 feet AGL, and the response to sonic booms

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Vegetation and Wildlife (Corresponds with Chapter 4, Base-Specific Sections 3.6) Airspace *continued*				
• Because of measures to avoid the potential for wildland fire from flare use, it is unlikely that flare use associated with the F-35A training will appreciably increase the incidence of rangeland fires; therefore, impacts on vegetation and wildlife would be less than significant. • Bird–aircraft collisions would occur infrequently and would not represent a substantial source of mortality for bird species. • Given the long history as an airfield and ongoing level of activity at Mountain Home AFB, wildlife species are not expected to be adversely affected by changes in aircraft overflight and noise associated with transformation to the F-35A aircraft.	• Because of measures to avoid the potential for wildland fire from flare use, it is unlikely that flare use associated with the F-35A training will appreciably increase the incidence of rangeland fires; therefore, impacts on vegetation and wildlife would be less than significant. • Bird–aircraft collisions would occur infrequently and would not represent a substantial source of mortality for bird species. • Given the long history as an airfield and ongoing level of activity at RIAC, EPIA, and Biggs AAF, wildlife species are not expected to be adversely affected by changes in aircraft overflight and noise associated with transformation to the F-35A aircraft.		• Because of measures to avoid the potential for wildland fire from flare use, it is unlikely that flare use associated with the F-35A training will appreciably increase the incidence of rangeland fires; therefore, impacts on vegetation and wildlife would be less than significant. • Bird–aircraft collisions would occur infrequently and would not represent a substantial source of mortality for bird species. • The increase in airfield operations at Gila Bend AFAF and Aux-1 associated with F-35A training may contribute to an incremental increase in bird–aircraft collisions. Avoidance protocols are in place to minimize risk to pilots, aircraft, and wildlife.	observed in free ranging wildlife is generally minimal, the incremental increase in sonic booms is not expected to result in a significant impact on wildlife. • Because of measures to avoid the potential for wildland fire from flare use, it is unlikely that flare use associated with the F-35A training will appreciably increase the incidence of rangeland fires; therefore, impacts on vegetation and wildlife would be less than significant. • Bird–aircraft collisions would occur infrequently and would not represent a substantial source of mortality for bird species. • Given the long history as an airfield and ongoing level of activity at Libby AAF, wildlife species in the vicinity of Libby AAF are not expected to be adversely affected by changes in aircraft overflight and noise associated with transformation to the F-35A aircraft.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Wetlands and Aquatic Communities (Corresponds with Chapter 4, Base-Specific Sections 3.7)				
Base • No jurisdictional wetlands have been identified on Boise AGS. No wetlands or aquatic habitats would be within the construction zones where they could be directly affected by construction. • Measures to control erosion, siltation, and fugitive dust would be included as part of the project implementation, minimizing the potential for construction to indirectly affect offsite aquatic and wetland habitats and biota. • No adverse effects on aquatic or wetland habitats in the vicinity of Boise AGS are expected from operations of the F-35As. Airspace • No adverse effects on aquatic or wetland habitats are expected from F-35A training operations in primary use airspace. • There would be a very low probability that an unburned flare or material from a flare would reach an aquatic or wetland environment.	Base • No wetlands or aquatic habitats would be within the construction zones where they could be directly affected by construction. • Measures to control erosion, siltation, and fugitive dust would be included as part of the project implementation, minimizing the potential for construction to indirectly affect offsite aquatic and wetland habitats and biota. • No adverse effects on aquatic or wetland habitats in the vicinity of Holloman AFB are expected from operations of the F-35As. Airspace • No adverse effects on aquatic or wetland habitats are expected from F-35A training operations in primary use airspace. • There would be a very low probability that an unburned flare or material from a flare would reach an aquatic or wetland environment.	Base • Impacts would be similar to those described in the previous column. Airspace • Impacts would be similar to those described in the previous column.	Base • No wetlands or aquatic communities would be within the construction zones where they could be directly affected by construction. • Measures to control erosion, siltation, and fugitive dust would be included as part of the project implementation, minimizing the potential for construction to indirectly affect offsite aquatic and wetland habitats and biota. • No adverse effects on aquatic or wetland habitats in the vicinity of Luke AFB are expected from operations of the F-35As. Airspace • No adverse effects on aquatic or wetland habitats are expected from F-35A training operations in primary use airspace. • There would be a very low probability that an unburned flare or material from a flare would reach an aquatic or wetland environment.	Base • No wetlands or aquatic communities would be within the construction zones where they could be directly affected by construction. • Measures to control erosion, siltation, and fugitive dust would be included as part of the project implementation, minimizing the potential for construction to indirectly affect offsite aquatic and wetland habitats and biota. • No adverse effects on aquatic or wetland habitats in the vicinity of Tucson AGS are expected from operations of the F-35As. Airspace • No adverse effects on aquatic or wetland habitats are expected from F-35A training operations in primary use airspace. • There would be a very low probability that an unburned flare or material from a flare would reach an aquatic or wetland environment.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Wetlands and Aquatic Communities (Corresponds with Chapter 4, Base-Specific Sections 3.7) Airspace *continued*				
• No adverse effects on wetland or aquatic communities in the vicinity of Mountain Home AFB are expected from F-35A training.	• No adverse effects on wetland or aquatic communities in the vicinity of RIAC, EPIA, or Biggs AAF are expected from F-35A training.		• No adverse effects on wetland or aquatic communities in the vicinity of Aux-1 or Gila Bend AFAF are expected from F-35A training.	• No adverse effects on wetland or aquatic communities in the vicinity of Libby AAF are expected from F-35A training.
Threatened and Endangered Species (Corresponds with Chapter 4, Base-Specific Sections 3.8)				
Base • Siting of facilities would be conducted to avoid direct or indirect impacts on slickspot peppergrass or its critical habitat, given its proximity to the airfield. Therefore, no significant impacts are expected. • No other known federally listed, proposed, or candidate threatened or endangered wildlife species or their habitats occur on Boise AGS; therefore, no adverse construction effects are anticipated.	Base • Because the proposed construction areas on Holloman AFB are located in previously disturbed areas, and no known federally listed, proposed, or candidate threatened or endangered species or habitats occur on Holloman AFB, no adverse effects from construction are anticipated.	Base • Impacts would be similar to those described in the previous column.	Base • No known federally listed, proposed, or candidate threatened or endangered species or habitats occur on Luke AFB; therefore, no adverse effects are anticipated. • Compliance with the Arizona Native Plant Law would apply for any proposed ground-disturbing action on Luke AFB.	Base • No known federally listed, proposed, or candidate threatened or endangered species or habitats occur on Tucson AGS; therefore, no adverse effects are anticipated. • Compliance with the Arizona Native Plant Law would apply for any proposed ground-disturbing action on Tucson AGS.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Threatened and Endangered Species (Corresponds with Chapter 4, Base-Specific Sections 3.8) Base *continued*				
• No significant noise impacts from airfield operations are expected on threatened or endangered wildlife that may occur on base due to the qualitatively similar nature of F-35A operations to current and historical operations associated with the existing military airfield environment at Boise AGS. Airspace • The potential for adverse effects of F-35A training in the airspace and at auxiliary airfields on listed, proposed, or candidate threatened or endangered wildlife is minimal, as described above for vegetation and wildlife. Although it is possible for an individual of a federally listed wildlife species to exhibit a temporary response to a low-level overflight or sonic boom, such as assuming an alert posture, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which "take" would occur.	• No significant noise impacts are expected on threatened or endangered wildlife that may occur on base due to the qualitatively similar nature of F-35A operations in the existing airfield environment. Airspace • The potential for adverse effects of F-35A training in the airspace and at auxiliary airfields on listed, proposed, or candidate threatened or endangered wildlife is minimal, as described above for vegetation and wildlife. Although it is possible for an individual of a federally listed wildlife species to exhibit a temporary response to a low-level overflight or sonic boom, such as assuming an alert posture, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which "take" would occur.	Airspace • Impacts would be similar to those described in the previous column.	• No significant noise impacts are expected on threatened or endangered wildlife that may occur on base due to the qualitatively similar nature of F-35A operations to current and historical operations associated with the existing military airfield environment at Luke AFB. Airspace • The potential for adverse effects of F-35A training in the airspace and at the auxiliary airfields on listed, proposed, or candidate threatened or endangered wildlife is minimal, as described above for vegetation and wildlife. Although it is possible for an individual of a federally listed wildlife species to exhibit a temporary response to a low-level overflight or sonic boom, such as assuming an alert posture, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which "take" would occur.	• No significant noise impacts are expected on threatened or endangered wildlife that may occur on base due to the qualitatively similar nature of F-35A operations to current and historical operations associated with the existing airfield environment at Tucson AGS. Airspace • The potential for adverse effects of F-35A training in the airspace and at the auxiliary airfields on listed, proposed, or candidate threatened or endangered wildlife is minimal, as described above for vegetation and wildlife. Although it is possible for a federally listed wildlife species to exhibit a temporary response, such as assuming an alert posture to a low-level overflight or sonic boom, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which "take" would occur.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Threatened and Endangered Species (Corresponds with Chapter 4, Base-Specific Sections 3.8) Airspace *continued*				
• The probability of a bird–aircraft strike or other project action involving injury to a listed endangered or threatened species is so low as to be discountable. • Therefore, impacts on threatened and endangered species would be less than significant.	• The probability of a bird–aircraft strike or other project action involving injury to a listed endangered or threatened species is so low as to be discountable. • Therefore, impacts on threatened and endangered species would be less than significant.		• The probability of a bird–aircraft strike or other project action involving injury to a listed endangered or threatened species is so low as to be discountable. • Therefore, impacts on threatened and endangered species would be less than significant.	• The probability of a bird–aircraft strike or other project action involving injury to a listed endangered or threatened species is so low as to be discountable. • Therefore, impacts on threatened and endangered species would be less than significant.
Cultural Resources (Corresponds with Chapter 4, Base-Specific Sections 3.9)				
Base • Impacts on architectural resources could occur; prior to construction, National Historic Preservation Act (NHPA) Section 106 consultation with the Idaho State Historic Preservation Office (SHPO) would take place regarding visual and other impacts on the Historic Districts.	Base • Impacts on architectural resources from new construction or renovation could occur if any affected building is eligible for the National Register of Historic Places (NRHP). Unevaluated potentially NRHP-eligible buildings in the project area would be addressed in compliance with NHPA Section 106 prior to construction or renovation.	Base • Impacts on architectural resources from new construction or renovation could occur if any affected building is NRHP eligible. Unevaluated potentially NRHP-eligible buildings in the project area would be addressed in compliance with NHPA Section 106 prior to construction or renovation.	Base • Impacts on architectural resources from new construction or renovation could occur if any affected building is NRHP eligible. One of nine potentially significant Cold War era buildings (958) would be affected. Section 106 consultation with the Arizona SHPO has been completed and the Air Force received concurrence on no effects on historic properties.	Base • Impacts on architectural resources would not occur. The Air Force has completed Section 106 consultation with the Arizona SHPO and received concurrence on no effects on historic properties.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Cultural Resources (Corresponds with Chapter 4, Base-Specific Sections 3.9) Base *continued*				
• Impacts on archaeological resources are not expected. Unsurveyed portions of the project area would be addressed in compliance with NHPA Section 106 prior to construction. Inadvertent discovery of previously unrecorded cultural resources during construction would be managed in compliance with Federal and state laws and Air Force regulations. • Impacts on traditional cultural resources are unlikely; there are no known Native American traditional cultural properties or traditional cultural resources at the installation.	• Impacts on archaeological resources are not expected; none of the 250 known sites is within the region of influence (ROI) of proposed construction projects. Inadvertent discovery of previously unrecorded cultural resources during construction would be managed in compliance with Federal and state laws and Air Force regulations. • Impacts on traditional cultural resources are unlikely; there are no known Native American traditional cultural properties or traditional cultural resources at the installation.	• Impacts on archaeological resources are not expected; none of the 250 known sites is within the ROI of proposed construction projects. Inadvertent discovery of previously unrecorded cultural resources during construction would be managed in compliance with Federal and state laws and Air Force regulations. • Impacts on traditional cultural resources are unlikely; there are no known Native American traditional cultural properties or traditional cultural resources at the installation.	• Impacts on archaeological resources are not expected. Construction would occur within the previously disturbed Luke AFB cantonment area, which has a very low probability of having intact cultural deposits. All of the known archaeological sites eligible for listing in the NRHP are well outside the area within which proposed construction would occur. Inadvertent discovery of previously unrecorded cultural resources during construction would be managed in compliance with Federal and state laws and Air Force regulations. • Impacts on traditional resources are unlikely; there are no known Native American traditional cultural properties or traditional cultural resources at the installation.	• Impacts on archaeological resources are not expected. Inadvertent discovery of previously unrecorded cultural resources during construction would be managed in compliance with Federal and state laws and Air Force regulations. • Impacts on traditional resources are unlikely; there are no known Native American traditional cultural properties or traditional cultural resources at the installation.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Cultural Resources (Corresponds with Chapter 4, Base-Specific Sections 3.9) *continued*				
Airspace • No impacts on historic properties under Boise AGS-associated airspace are expected. Increases in airspace use, subsonic noise, and sonic booms would not be of sufficient magnitude to impact historic properties under airspace. • Increases in subsonic noise and sonic booms and continued flare use are likely to be considered by Native American groups to have an impact on traditional use of the area. Air Force consultation with interested Native American groups regarding airspace actions has been completed.	Airspace • No impacts on historic properties under Holloman AFB-associated airspace are expected. Increases in airspace use and subsonic noise under the MOAs and MTRs would not be of sufficient magnitude to impact historic properties under airspace. • Increases in subsonic noise and sonic booms and continued flare use are likely to be considered by Native American groups to have an impact on traditional use of the area. Air Force consultation with interested Native American groups regarding airspace actions has been completed.	Airspace • No impacts on historic properties under Holloman AFB-associated airspace are expected. Increases in airspace use and subsonic noise under the MOAs and MTRs would not be of sufficient magnitude to impact historic properties under airspace. • Increases in subsonic noise and sonic booms and continued flare use are likely to be considered by Native American groups to have an impact on traditional use of the area. Air Force consultation with interested Native American groups regarding airspace actions has been completed.	Airspace • No impacts on historic properties under Luke AFB-associated airspace are expected. Increases in airspace use and subsonic noise under the MOAs and MTRs would not be of sufficient magnitude to impact historic properties under airspace. • Increases in subsonic noise and continued flare use are likely to be considered by Native American groups to have an impact on traditional use of the area. Air Force consultation with interested Native American groups regarding airspace actions has been completed.	Airspace • No impacts on historic properties under Tucson AGS-associated airspace are expected. Increases in airspace use and subsonic noise under the airspace would not be of sufficient magnitude to impact historic properties. • Increases in subsonic noise and continued flare use are likely to be considered by Native American groups to have an impact on traditional use of the area. Air Force consultation with interested Native American groups regarding airspace actions has been completed.
Land Use and Recreation (Corresponds with Chapter 4, Base-Specific Sections 3.10)				
Base • Construction to support the beddown would be sited in accordance with current installation land use plans and applicable design standards.	Base • Construction to support the beddown would be sited in accordance with current installation land use plans and applicable design standards.	Base • Construction to support the beddown would be sited in accordance with current installation land use plans and applicable design standards.	Base • Construction to support the beddown would be sited in accordance with current installation land use plans and applicable design standards. • Total area and residential area affected by noise levels of 65 dB DNL or greater would decrease under Scenarios L1 and L2.	Base • Construction to support the beddown would be sited in accordance with current installation land use plans and applicable design standards.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Land Use and Recreation (Corresponds with Chapter 4, Base-Specific Sections 3.10) Base *continued*				
• Under Scenario B1, an additional 2,944 total off-installation acres (362 of which are developed for residential use) would be affected by noise levels of at least 65 dB DNL, the noise level at which several land use types are considered to be incompatible per Air Force land use guidelines. • Under Scenarios B2 and B3, an additional 4,999 total acres (754 residential) and 6,872 total acres (1,422 residential), respectively would be affected by noise levels of at least 65 dB DNL. • Noise levels at recreational locations would increase but would remain generally compatible with recreational land use under all scenarios. • New personnel would increase city-wide demand for public recreational amenities by about 1% under Scenario B1 and 2% under Scenarios B2 and B3, with minimal impact.	• Under Scenario H1W, an additional 1,998 total off-installation acres (4 of which are designated for residential use) would be affected by noise levels of at least 65 dB DNL, the noise level at which several land use types are considered to be incompatible per Air Force land use guidelines. • Under Scenarios H2W and H3W, an additional 3,572 total acres (9 residential) and 4,975 total acres (16 residential), respectively, would be affected by noise levels of at least 65 dB DNL. • Noise levels at recreational locations would increase but would remain generally compatible with recreational land use under all scenarios. • Recreational demands of additional personnel and dependents expected to be met primarily by on-base facilities; excess recreational capacity is expected to exist in Alamogordo as Holloman AFB population has decreased recently.	• Total area and residential area affected by noise levels of 65 dB DNL or greater would decrease under Scenario H1. Under Scenarios H2, H3, H4, and H5, the total area affected by noise levels of 65 dB DNL or greater would increase between 717 and 4,526 acres, but the residential area affected would decrease by 32 acres. • Noise levels at recreational locations would increase but remain generally compatible with recreational land use under all scenarios. • Recreational demands of additional personnel and dependents are expected to be met primarily by on-base facilities; excess recreational capacity is expected to exist in Alamogordo as Holloman AFB population has decreased recently.	• Under Scenario L3, an additional 874 total off-installation acres (247 of which are developed for residential use) would be affected by noise levels of at least 65 dB DNL, the noise level at which several land use types are considered to be incompatible per Air Force land use guidelines. • Under Scenarios L4, L5, and L6, an additional 2,357 total acres (478 residential), 3,636 total acres (656 residential), and 4,608 acres (819 residential), respectively, would be affected by noise levels of at least 65 dB DNL. • Approximately 97.8 to 99.6 percent of the off-installation acreage is currently identified as within the state-designated JLUS high noise area. • Under Scenarios L3, L4, L5, and L6, a total of 7 acres (0 residential), 34 acres (4 residential), 117 acres (36 residential), and 252 acres (78 residential) would be affected by noise levels of at least 65 dB DNL outside of the 65 dB DNL line established in the Luke AFB 1988 Joint Land Use Study. • Noise levels at recreational locations would increase but would remain generally compatible with recreational land use under all scenarios.	• Under Scenario T1, an additional 701 total off-installation acres (0 of which are developed for residential use) would be affected by noise levels of at least 65 dB DNL, the noise level at which several land use types are considered to be incompatible per Air Force land use guidelines. • Under Scenarios T2 and T3, an additional 1,551 total acres (153 residential) and 2,439 total acres (308 residential), respectively, would be affected by noise levels of at least 65 dB DNL. • Noise levels at recreational locations would increase but would remain generally compatible with recreational land use under all scenarios. • Additional personnel and dependents would make up a small fraction of Tucson metropolitan area population; no problems with meeting recreational demands are expected.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Land Use and Recreation (Corresponds with Chapter 4, Base-Specific Sections 3.10) Base *continued*				
Airspace • Subsonic and supersonic aircraft noise beneath several training airspace units would increase, potentially diminishing the enjoyment of recreational users of affected Special Use Land Management Areas (SULMAs) through disturbance of the natural setting. • Ninety-five SULMAs are located fully or partially underneath F-35A primary training airspace; F-35A aircraft would comply with all existing restrictions on supersonic and subsonic flight. • SULMAs potentially affected include National Park Service units. Increased airspace use in these areas has the potential to impact visitor experience and the setting and feeling of the areas.	Airspace • Subsonic and supersonic aircraft noise beneath several training airspace units would increase, potentially diminishing the enjoyment of recreational users of affected SULMAs through disturbance of the natural setting. • Thirty-four SULMAs are located fully or partially underneath F-35A primary training airspace; F-35A aircraft would comply with all existing restrictions on supersonic and subsonic flight. • SULMAs potentially affected include National Park Service units. Increased airspace use in these areas has the potential to impact visitor experience and the setting and feeling of the areas.	Airspace • Subsonic and supersonic aircraft noise beneath several training airspace units would increase, potentially diminishing the enjoyment of recreational users of affected SULMAs through disturbance of the natural setting. • Thirty-four SULMAs are located fully or partially underneath F-35A primary training airspace; F-35A aircraft would comply with all existing restrictions on supersonic and subsonic flight. • SULMAs potentially affected include National Park Service units. Increased airspace use in these areas has the potential to impact visitor experience and the setting and feeling of the areas.	• Additional personnel and dependents would make up a small fraction of Phoenix metropolitan area population; no problems with meeting recreational demands are expected. Airspace • Subsonic and supersonic aircraft noise beneath several training airspace units would increase, potentially diminishing the enjoyment of recreational users of affected SULMAs through disturbance of the natural setting. • Fifty-one SULMAs are located fully or partially underneath F-35A primary training airspace; F-35A aircraft would comply with all existing restrictions on supersonic and subsonic flight. • SULMAs potentially affected include National Park Service units. Increased airspace use in these areas has the potential to impact visitor experience and the setting and feeling of the areas.	Airspace • Subsonic and supersonic aircraft noise beneath several training airspace units would increase, potentially diminishing the enjoyment of recreational users of affected SULMAs through disturbance of the natural setting. • Forty-six SULMAs are located fully or partially underneath F-35A primary training airspace; F-35A aircraft would comply with all existing restrictions on supersonic and subsonic flight. • SULMAs potentially affected include National Park Service units. Increased airspace use in these areas has the potential to impact visitor experience and the setting and feeling of the areas.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Land Use and Recreation (Corresponds with Chapter 4, Base-Specific Sections 3.10) Airspace *continued*				
• Noise levels in the vicinity of Mountain Home AFB would increase under all scenarios, potentially increasing incompatible land use. While the acreage in area exposed to 65 dB DNL or greater would increase, the number of persons affected would be relatively small.	• Noise levels in the vicinity of RIAC, EPIA, and Biggs AAF would increase under all scenarios, potentially increasing incompatible land use. • Residents from communities near recreation areas in the Sacramento mountains expressed annoyance with the existing overflights on the MTRs and sonic booms from the ATCAAs and anticipated greater annoyance with any future missions.	• Residents from communities near recreation areas in the Sacramento mountains expressed annoyance with the existing overflights on the MTRs and sonic booms from the ATCAAs and anticipated greater annoyance with any future missions.	• Noise levels in the vicinity of Gila Bend AFAF would increase under all scenarios. Noise levels in the vicinity of Aux-1 would decrease under all scenarios except Scenario L6, under which there would be a decrease in acres affected by noise levels of at least 65 dB DNL but an increase in population affected of 92.	• Noise levels of at least 65 dB DNL in the vicinity of Libby AAF are entirely on Fort Huachuca or Sierra Vista Municipal Airport; no additional incompatible development is expected.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Socioeconomics (Corresponds with Chapter 4, Base-Specific Sections 3.11)				
Base • Construction expenditures would generate between 2,188 and 2,635 new jobs under Scenarios B1 through B3. Jobs would likely be filled by unemployed persons in Ada County without generating migration to area. • Population would increase between 1 and 2.6%, including personnel and dependents, under Scenarios B1 through B3. • Changes in personnel would create between 188 and 487 induced jobs under Scenarios B1 through B3. The increased personnel and induced employment would increase total employment in Ada County by between 0.3 and 0.8%.	Base • Construction expenditures would generate between 3,447 and 4,737 new jobs under Scenarios H1W through H3W. Jobs would likely be filled by unemployed persons in Otero County and may encourage migration to the area from nearby communities for new employment. • Population would increase between 7.4 and 18.4%, including personnel and dependents, under Scenarios H1W through H3W. • Changes in personnel would create between 123 and 306 induced jobs under Scenarios H1W through H3W. The increased personnel and induced employment would increase total employment in Otero County by between 3 and 7.5%.	Base • Construction expenditures would generate between 718 and 4,415 new jobs under Scenarios H1 through H5. Jobs would likely be filled by unemployed persons in Otero County and may encourage migration to the area from nearby communities for new employment. • Population would change from a decrease of 3.8% to an increase of 18.1%, including personnel and dependents, under Scenarios H1 through H5. • Changes in personnel would range from the loss of an estimated 58 induced jobs under Scenario H1 to creating 308 jobs under Scenario H5. Total employment from the change in personnel and induced employment would change total employment in Otero County from a decrease of 1.4% to an increase of 7.5% under Scenarios H1 through H5.	Base • Construction expenditures would generate between 1,532 and 2,657 new jobs under Scenarios L1 through L6. Jobs would likely be filled by unemployed persons in Maricopa County and the ROI cities. • Population would change from a decrease of 0.06% to an increase of 0.32%, including personnel and dependents, under Scenarios L1 through L6. • Changes in personnel would range from the loss of an estimated 161 induced jobs under Scenario L1 up to creating 989 jobs under Scenario L6. The change in personnel and induced employment would change total employment in Maricopa County from a decrease of 0.02% to an increase of 0.14% under Scenarios L1 through L6.	Base • Construction expenditures would generate between 1,815 and 2,089 new jobs under Scenarios T1 through T3. Jobs would likely be filled by unemployed persons in Pima County. • Population would change from a decrease of 0.09% to an increase of 0.18%, including personnel and dependents, under Scenarios T1 through T3. • Changes in personnel would range from the loss of an estimated 47 induced jobs under Scenario T1 up to creating 123 jobs under Scenario T3. The change in personnel and induced employment would change total employment in Pima County from a decrease of 0.03% to an increase of 0.09% under Scenarios T1 through T3.

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Socioeconomics (Corresponds with Chapter 4, Base-Specific Sections 3.11) Base *continued*				
• Housing market would not be adversely impacted as the number of vacant housing units would be capable of providing housing for new personnel under all Boise AGS scenarios. • Estimated increase in school-aged students would range from 661 to 1,715 students under Scenarios B1 through B3. Additional teachers may be needed, but would be dependent on tax revenues. Schools are anticipated to have capacity to accommodate new students. • New personnel and related induced jobs would increase local, state, and Federal tax revenues by between $10.22 million and $26.53 million under Scenarios B1 through B3. • Changes in law enforcement, firefighters, and medical professionals would be generated by population changes under all F-35A scenarios, but would be dependent on tax revenues and budgetary requirements.	• Combination of jobs created by construction expenditures and personnel changes may result in migration from surrounding communities. Additional housing demand may result in a shortage of available housing in the short term. Housing development would be encouraged in the long term. • Estimated increase in school-aged students would range from 709 to 1,763 students under Scenarios H1W through H3W. Additional teachers may be needed, but would be dependent on tax revenues. Schools are anticipated to have capacity to accommodate new students. • New personnel and related induced jobs would increase local, state, and Federal tax revenues by between $14.66 million and $36.47 million under Scenarios H1W through H3W.	• Combination of jobs created by construction expenditures and personnel changes may result in migration from surrounding communities. Additional housing demand may result in a shortage of available housing in the short term. Housing development would be encouraged in the long term. • Estimated increase in school-aged students would range from the loss of 332 students under Scenario H1 to an increase of 1,775 students under Scenario H5. Additional teachers may be needed, but would be dependent on tax revenues. Schools are anticipated to have capacity to accommodate new students. • New personnel and related induced jobs would change local, state, and Federal tax revenues from a decrease of $6.88 million to an increase of $36.71 million under Scenarios H1 through H5.	• Housing market would not be adversely impacted as the number of vacant housing units would be capable of providing housing for new personnel under all Luke AFB scenarios. • Estimated increase in school-aged students would range from the loss of 369 students under Scenario L1 to an increase of 2,265 students under Scenario L6. Additional teachers may be needed, but would be dependent on tax revenues. Schools are anticipated to have capacity to accommodate new students. • New personnel and related induced jobs would change local, state, and Federal tax revenues from a decrease of $9.17 million to an increase of $56.23 million under Scenarios L1 through L6.	• Housing market would not be adversely impacted as the number of vacant housing units would be capable of providing housing for new personnel under all Tucson AGS scenarios. • Estimated increase in school-aged students would range from the loss of 130 students under Scenario T1 to an increase of 342 students under Scenario T3. Additional teachers may be needed, but would be dependent on tax revenues. Schools are anticipated to have capacity to accommodate new students. • New personnel and related induced jobs would change local, state, and Federal tax revenues from a decrease of $3.54 million to an increase of $9.36 million under Scenarios T1 through T3.

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Socioeconomics (Corresponds with Chapter 4, Base-Specific Sections 3.11) Base *continued*				
• Noise generated by F-35A flight operations has the potential to adversely impact property values for those properties and residents newly exposed to noise levels >65 dB DNL and particularly for properties newly exposed to noise levels >75 dB DNL. • Studies have calculated a property value discount of 0.5 to 0.6 percent per dB between 65 dB and 75 dB DNL, with higher discounts above 75 dB DNL.	• Changes in law enforcement, firefighters, and medical professionals would be generated by population changes under all F-35A scenarios, but would be dependent on tax revenues and budgetary requirements. • Noise generated by F-35A flight operations would not change the number of residents affected by noise levels >65 dB DNL; therefore, no impacts on off-base residents or property values are anticipated. • Studies have calculated a property value discount of 0.5 to 0.6 percent per dB between 65 dB and 75 dB DNL, with higher discounts above 75 dB DNL.	• Changes in law enforcement, firefighters, and medical professionals would be generated by population changes under all F-35A scenarios, but would be dependent on tax revenues and budgetary requirements. • Residents and properties affected by noise levels >65 dB DNL would decrease. No impacts on residents or property values are anticipated. • Studies have calculated a property value discount of 0.5 to 0.6 percent per dB between 65 dB and 75 dB DNL, with higher discounts above 75 dB DNL.	• Changes in law enforcement and firefighters would be generated by population changes under all F-35A scenarios, but would be dependent on tax revenues and budgetary requirements. Because Luke AFB is located in a major metropolitan area, the number of medical professionals is anticipated to be adequate for the personnel change under all F-35A scenarios. • Noise generated by F-35A flight operations has the potential to adversely impact property values for those properties and residents outside the JLUS high noise area but newly exposed to noise levels >65 dB DNL and particularly for properties newly exposed to noise levels >75 dB DNL. Existing properties within the JLUS have a discount due to being designated as within a high noise area. Since properties within the JLUS already reflect noise-related discount values, new impacts upon most properties would not be expected to occur.	• Changes in law enforcement and firefighters would be generated by population changes under all F-35A scenarios, but would be dependent on tax revenues and budgetary requirements. Because Tucson AGS is located in a major metropolitan area, the number of medical professionals is anticipated to be adequate for the personnel change under all F-35A scenarios. • Noise generated by F-35A flight operations has the potential to adversely impact property values for those properties and residents newly exposed to noise levels >65 dB DNL and particularly for properties newly exposed to noise levels >75 dB DNL. • Studies have calculated a property value discount of 0.5 to 0.6 percent per dB between 65 dB and 75 dB DNL, with higher discounts above 75 dB DNL.

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Socioeconomics (Corresponds with Chapter 4, Base-Specific Sections 3.11) *continued*				
Airspace • Residents living under the Jarbidge North MOA/ATCAA, Owyhee North MOA/ATCAA, IR-302/305, and IR-301/307 may notice the increase in noise levels and be annoyed. Noise levels under these airspace units are not expected to adversely impact economic decisions, property values, or other socioeconomic resources underlying the airspace. • Elmore County provides zoning for a 2-mile noise and safety buffer for Mountain Home AFB to reduce any potential development and avoid the potential for military operations to adversely affect property values.	Airspace • Residents under the Beak, Talon, Cato, and Pecos airspace units would likely notice the increase in noise levels and be annoyed. Noise levels under these airspace units are not expected to adversely impact economic decisions, property values, or other socioeconomic resources in the areas underlying the airspace, although the percentage of annoyed residents could increase. Residents living under R-5107, R-5103, and the overlapping MTRs could be adversely impacted by the increased noise from 56 dB up to 62 dB DNL under Scenario H3W. • Noise generated from F-35A training at RIAC, EPIA, and Biggs AAF has the potential to adversely affect property values, as described for noise levels in the vicinity of Holloman AFB.	Airspace • Residents under the Beak, Talon, Cato, and Pecos airspace units would likely notice the increase in noise levels and be annoyed. Noise levels under these airspace units are not expected to adversely impact economic decisions, property values, or other socioeconomic resources in the areas underlying the airspace, although the percentage of annoyed residents could increase. Residents living under R-5107, R-5103, and the overlapping MTRs could be adversely impacted by the increased noise from 56 dB up to 65 dB DNL under Scenario H5. • Noise generated from F-35A training at RIAC, EPIA, and Biggs AAF has the potential to adversely affect property values, as described for noise levels in the vicinity of Holloman AFB.	Airspace • Noise levels would remain <65 dB DNL_{mr}. Change in noise would be noticed and may cause annoyance, but no impacts on property values or other socioeconomic resources are expected. • Noise generated from F-35A training at Aux-1 and Gila Bend AFAF has the potential to adversely affect property values, as described for noise levels in the vicinity of Luke AFB.	Airspace • Noise levels would remain <55 dB DNL beneath the primary use airspace. Change in noise would be noticed and may cause annoyance, but no impacts on property values or other socioeconomic resources are expected. • Noise generated from F-35A training at Libby AAF would not impact off-base residents.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Environmental Justice and Protection of Children (Corresponds with Chapter 4, Base-Specific Sections 3.12)				
Base • Construction would occur within Boise AGS cantonment area and would not impact off-base populations. • No disproportionately high and adverse impacts on minority or low-income populations are expected under all F-35A scenarios at Boise AGS. Minority and low-income populations affected by noise levels >65 dB DNL would be comparable to the minority and low-income populations in Ada County, the community of comparison. • Schools and child care centers affected by noise levels >65 dB DNL are compatible with educational services with additional noise attenuation and incompatible with noise levels >75 dB DNL. Between 1 and 2 schools under Scenarios B1 through B3 would be affected by noise levels >65 dB DNL. Between 3 and 13 child care centers would be affected by noise levels >65 dB DNL.	Base • Construction would occur within Holloman AFB cantonment area and would not impact off-base populations. • No disproportionately high and adverse impacts on minority or low-income populations are expected under Scenario H1W, H2W, or H3W. Minority and low-income populations affected by noise levels >65 dB DNL would be lower than the minority and low-income populations in Otero County, the community of comparison. • Schools and child care centers affected by noise levels >65 dB DNL are compatible with educational services with additional noise attenuation and incompatible with noise levels >75 dB DNL. Under Scenarios H1W through H3W, the 2 on-base schools and 2 on-base child care centers would be affected by noise levels >65 dB DNL.	Base • Construction would occur within Holloman AFB cantonment area and would not impact off-base populations. • No disproportionately high and adverse impacts on minority or low-income populations are expected under Scenario H1, H2, H3, H4, or H5. Noise levels >65 dB DNL would affect fewer residents as compared to baseline noise levels. • Schools and child care centers affected by noise levels >65 dB DNL are compatible with educational services with additional noise attenuation and incompatible with noise levels >75 dB DNL. Under Scenarios H1 through H5, 2 on-base schools and 2 on-base child care centers would be affected by noise levels between 70 and 74 dB DNL.	Base • Construction would occur within Luke AFB cantonment area and would not impact off-base populations. • There is the potential for disproportionately high and adverse impacts on minority populations under Scenarios L1 and L2 due to a higher share of minority populations affected by noise levels >65 dB DNL as compared to the community of comparison, Maricopa County. No disproportionately high and adverse impacts on minority populations are expected under Scenarios L3 through L6. No disproportionately high and adverse impacts on low-income populations are expected under all F-35A scenarios at Luke AFB. • Schools and child care centers affected by noise levels >65 dB DNL are compatible with educational services with additional noise attenuation and incompatible with noise levels >75 dB DNL.	Base • Construction would occur within Tucson AGS cantonment area and would not impact off-base populations. • The F-35A aircraft scenarios would present a disproportionately high and adverse impact on low-income populations. The share of low-income persons affected by noise levels >65 dB DNL is higher as compared to the community of comparison, Pima County. The share of minority populations affected by noise levels >65 dB DNL under baseline conditions and all F-35A scenarios is substantially higher than the share of minority populations in Pima County.

<u>Boise AGS</u> <u>(See Chapter 4, Section BO)</u> Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	<u>Holloman AFB</u> <u>(See Chapter 4, Section HO)</u> Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	<u>Holloman AFB</u> <u>(See Chapter 4, Section HO)</u> Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	<u>Luke AFB</u> <u>(See Chapter 4, Section LU)</u> Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	<u>Tucson AGS</u> <u>(See Chapter 4, Section TU)</u> Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Environmental Justice and Protection of Children (Corresponds with Chapter 4, Base-Specific Sections 3.12) Base *continued*				
			• Under Scenario L1, no schools or child care centers would be impacted by noise levels >65 dB DNL. Under Scenarios L2 through L4, 1 school, and under Scenarios L5 and L6, 2 schools would be affected by noise levels >65 dB DNL. The on-base child care centers would be affected under Scenarios L3 through L6, and 2 off-base child care centers would be affected under Scenarios L5 and L6 by noise levels >65 dB DNL.	• Schools and child care centers affected by noise levels >65 dB DNL are compatible with educational services with additional noise attenuation and incompatible with noise levels >75 dB DNL. Under Scenarios T1 through T3, between 1 and 2 schools and up to 1 child care center would be affected by noise levels >65 dB DNL.
<u>Airspace</u> • Current flight restrictions over the Duck Valley Reservation would be followed. There is the potential for disproportionately high and adverse impacts on minority and low-income populations beneath the Jarbidge North MOA/ATCAA because noise levels would exceed 65 dB DNL_{mr} and the total share of affected minority and low-income populations overflown is greater than the communities of comparison.	<u>Airspace</u> • There is the potential for disproportionately high and adverse impacts on minority and low-income populations overflown by IR-134/195. Noise levels would increase substantially between baseline conditions and Scenario H3W, and there is a higher proportion of minority and low-income populations under IR-134/195 as compared to the communities of comparison. No disproportionately high and	<u>Airspace</u> • There is the potential for disproportionately high and adverse impacts on minority and low-income populations overflown by IR-134/195. Noise levels would increase substantially between baseline conditions and Scenario H5, and there is a higher proportion of minority and low-income populations under IR-134/195 as compared to the communities of comparison. No disproportionately high and adverse impacts on populations	<u>Airspace</u> • There is the potential for disproportionately high and adverse impacts on minority and low-income populations overflown by Visual Route (VR)-223. Noise levels would increase substantially between baseline conditions and Scenario L6, and there is a higher proportion of minority and low-income populations under VR-223 as compared to the communities of comparison. Noise would remain <65 dB DNL_{mr} in the other airspace units overlying population centers.	<u>Airspace</u> • No disproportionately high and adverse impacts on minority or low-income populations are expected beneath the primary use airspace or Libby AAF. Minority and low-income populations beneath the airspace are comparable to the communities of comparison. No off-base residents would be affected by noise at Libby AAF.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Environmental Justice and Protection of Children (Corresponds with Chapter 4, Base-Specific Sections 3.12) Airspace *continued*				
• Minority and low-income populations affected by noise at Mountain Home AFB would be comparable to the community of comparison. The on-base school and child care center at Mountain Home AFB would be affected by noise levels >65 dB DNL.	adverse impacts on populations beneath the remaining airspace units are expected because the minority and low-income populations are comparable to the communities of comparison. • Minority and low-income populations in the vicinity of EPIA and Biggs AAF affected by noise levels >65 dB DNL would be comparable to the minority and low-income populations in El Paso County, the community of comparison. • Between 5 and 7 schools and between 3 and 4 child care centers in the vicinity of EPIA would be affected by noise levels >65 dB DNL. No schools or child care centers near Biggs AAF would be affected by noise levels >65 dB DNL. • There is the potential for disproportionately high and adverse impacts on minority populations from the F-35A training at RIAC. The minority populations affected by noise levels >65 dB DNL are greater than the minority population in Chaves County.	beneath the remaining airspace units are expected because the minority and low-income populations are comparable to the communities of comparison. • Minority and low-income populations in the vicinity of EPIA and Biggs AAF affected by noise levels >65 dB DNL would be lower than or comparable to the minority and low-income populations in El Paso County, the community of comparison. • Between 5 and 7 schools and between 3 and 4 child care centers in the vicinity of EPIA would be affected by noise levels >65 dB DNL. No schools or child care centers near Biggs AAF would be affected by noise levels >65 dB DNL. • There is the potential for disproportionately high and adverse impacts on minority populations from the F-35A training at RIAC. The minority populations affected by noise levels >65 dB DNL are greater than the minority population in Chaves County.	• No disproportionately high and adverse impacts on populations in areas surrounding Aux-1 or Gila Bend AFAF are expected. Affected minority and low-income populations are comparable to Maricopa County, the community of comparison. No schools in the vicinity of Aux-1 or Gila Bend AFAF would be affected.	

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Environmental Justice and Protection of Children (Corresponds with Chapter 4, Base-Specific Sections 3.12) Airspace *continued*				
	The low-income population affected by F-35A training is comparable to the low-income population in Chaves County. • Between 3 and 4 schools and 1 child care center near RIAC would be affected by noise levels >65 dB DNL.	The low-income population affected by F-35A training is comparable to the low-income population in Chaves County. • Between 3 and 4 schools and 1 child care center near RIAC would be affected by noise levels >65 dB DNL.		
Infrastructure (Corresponds with Chapter 4, Base-Specific Sections 3.13)				
Base • Scenarios B1, B2, and B3 would result in less than a 1% increase in potable water demand and wastewater generation. Existing capacity would meet these increases. No adverse impacts on water or wastewater facilities are expected. • Storm water would continue to be managed under the existing NPDES Multi-Sector General Permit.	Base • Scenarios H1W, H2W, and H3W would increase potable water demand by up to 6.95% over existing demand. • Currently, the city is developing new conservation measures and is trying to secure additional water supplies to meet current and projected demands. Adverse impacts associated with increased water usage in the area may be mitigated by implementing water conservation measures for on-base housing or for personnel residing off base (e.g., water conservation directives for off-base personnel, utility compensation incentives).	Base • Scenarios H3 through H5 would increase potable water demand by up to 6.8% over existing demand. • Currently, the city is developing new conservation measures and is trying to secure additional water supplies to meet current and projected demands. Adverse impacts associated with increased water usage in the area may be mitigated by implementing water conservation measures for on-base housing or for personnel residing off base (e.g., water conservation directives for off-base personnel, utility compensation incentives).	Base • Scenarios L2 through L6 would result in less than a 1% increase in potable water demand in the region. Existing capacity would meet this increase, and this increase would be less than significant. No adverse impacts on water facilities are expected. • Increases in off-base wastewater generation would be less than 1% of current regional treatment capacity. • The on-base wastewater treatment plant would experience an 8.7 to 158% increase if all personnel and their dependents associated with Scenarios L2, L3, L4, L5, and L6 were to live on base.	Base • Scenario T1 would result in a slight decrease in potable water demand and wastewater generation. • Scenarios T2 and T3 would result in less than a 1% increase in potable water demand and wastewater generation. Existing capacity would meet these increases. No adverse impacts on water or wastewater facilities are expected. • Storm water would continue to be managed under the existing SWPPP.

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Infrastructure (Corresponds with Chapter 4, Base-Specific Sections 3.13) Base *continued*				
• Solid waste generated during construction and increased operations under Scenarios B1, B2, and B3 would be disposed of at existing facilities without adverse effects on the capacity of those facilities. • Increases in electrical use and natural gas associated with new facilities and increases in personnel and dependents are anticipated to be less than 1% up to 1.6% of community electrical/natural gas usage.	• Increases in off-base wastewater generation would be between 1 and 13% of current treatment levels under Scenarios H1W through H3W. Adequate off-base capacity is available to process these flows. • If all personnel were to locate on base, then operating burdens would occur with increases of up to 39.1% under Scenario H3W. • Solid waste generated by the additional personnel associated with F-35A aircraft scenarios would be transported off site. Only minor impacts are anticipated on the solid waste management system at Holloman AFB due to the proposed demolition and construction. • The electrical energy and natural gas supply system at Holloman AFB is adequate and would not be affected by an increase of less than 1%. The Air Force expects increases in electrical use and natural gas associated with new facilities to be minimal given LEED [Leadership in Energy and Environmental Design] requirements for energy efficiency.	• Increases in off-base wastewater generation would be between 1.2 and 12.8% above current treatment levels under Scenarios H2 through H5. Adequate off-base capacity is available to process these flows. • If all personnel were to locate on base, then operating burdens would occur with increases of up to 38.4% under Scenario H5. • Solid waste generated by the additional personnel associated with F-35A aircraft scenarios would be transported off site. Only minor impacts are anticipated on the solid waste management system at Holloman AFB due to the proposed demolition and construction. • The electrical energy and natural gas supply system at Holloman AFB is adequate and would not be affected by an increase of approximately 1%. The Air Force expects increases in electrical use and natural gas associated with new facilities to be minimal given LEED requirements for energy efficiency.	Even with these increases, the base wastewater treatment plant would be able to meet these demands with the its current capacity. It is unknown whether the majority of personnel would reside on or off base; it is likely that personnel would be distributed in both locations and thereby reduce the potential impact on the on-base treatment plant. • Solid waste generated by the proposed demolition and construction and additional personnel associated with Scenarios L2 through L6 would be transported off site to the Glendale Municipal Landfill. • Increases in electrical use and natural gas associated with new facilities and the increases in personnel and dependents are anticipated to be less than 1% of community electrical/natural gas usage.	• Solid waste generated during construction and increased operations under Scenarios T1, T2, and T3 would be disposed of at existing offsite facilities without adverse effects on the capacity of those facilities. • Increases in electrical use and natural gas associated with new facilities at the162nd Fighter Wing (162 FW) and increases in personnel and dependents are anticipated to be less than 1% of community electrical/natural gas usage. • Solid waste generated during construction and increased operations under Scenarios T1, T2, and T3 would be disposed of at existing offsite facilities without adverse effects on the capacity of those facilities. • Increases in electrical use and natural gas associated with new facilities at the162 FW and the increases in personnel and dependents are anticipated to be less than 1% of community electrical/natural gas usage.
Airspace: Not Applicable	Airspace: Not Applicable	Airspace: Not Applicable	Airspace: Not Applicable	Airspace: Not Applicable

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Transportation (Corresponds with Chapter 4, Base-Specific Sections 3.14)				
Base • Construction traffic would result in short-term increases to on-base roads and possible degradation of road surfaces. • Under Scenario B1, vehicle trips would increase by 38%, requiring daily use of the Ellsworth Street Gate for peak morning and evening traffic. • Under Scenario B2, vehicle trips would increase by 78%; this increase would require synchronization of the current signalization at the Main Gate access for peak traffic, full-time use of the Ellsworth Street Gate, and instituting flextime. • Under Scenario B3, vehicle trips would increase by 135%; this increase would require planned signalization at the Main Gate access, full-time use of the Ellsworth Street Gate, instituting flextime, and an additional gate to reduce the potential effects at the Main Gate.	Base • Construction traffic would result in short-term increases to on-base roads and possible degradation of road surfaces. • Under Scenario H1W, vehicle trips would increase by 10%; the base's three gates have recently been upgraded, and multiple lanes and adequate cueing area are available to handle this increase. • Under Scenario H2W, vehicle trips would increase by 16%; the base could adjust the schedule of operations to accommodate this increase or provide additional personnel at the gate to process security checks during the peak hours. • Under Scenario H3W, vehicle trips would increase by 16%; the base may have to construct additional lanes and provide additional personnel to conduct security checks to reduce congestion at the Main Gate.	Base • Construction traffic would result in short-term increases to on-base roads and possible degradation of road surfaces. • Under Scenario H1, vehicle trips would decrease slightly; under Scenarios H2 and H3, vehicle trips would increase by up to 10%. The base's three gates have recently been upgraded, and multiple lanes and adequate cueing area are available to handle this increase. • Under Scenarios H4 and H5, vehicle trips would increase by between 16 and 21%. In addition to adjusting the work schedule to accommodate this increase or providing additional personnel at the gate to process security checks during the peak hours, the base may need to construct additional lanes at the gates to reduce congestion during times of peak traffic.	Base • Construction traffic would result in short-term increases to on-base roads and possible degradation of road surfaces. • Under Scenario L1, there would be a decrease in personnel and in vehicle trips; under Scenario L2, vehicle trips would increase by 2%. No adverse effects on traffic flow are expected. • Under Scenario L3, vehicle trips would increase by 10%; the three gates at the base would be able to accommodate this increase. • Under Scenarios L4 through L6, vehicle trips would increase by 18 to 34%; congestion at the three base gates during the morning and evening workday peak hours would increase. The base would adjust the schedule of operations or provide additional personnel at the gate to process security checks during the peak hours to accommodate this increase.	Base • Construction traffic would result in short-term increases to on-base roads and possible degradation of road surfaces. • Under Scenario T1, vehicle trips would increase by 3%; no noticeable effect on gate congestion is anticipated. • Under Scenario T2, vehicle trips would increase by 10%; the installation may adjust the schedule of operations to accommodate this increase or provide additional personnel at the gate to process security checks during the peak hours. • Under Scenario T3, vehicle trips would increase by 18%; the base would adjust the schedule of operations to accommodate this increase and provide additional personnel at the gate to process security checks during the peak hours.
Airspace: Not Applicable	Airspace: Not Applicable	Airspace: Not Applicable	Airspace: Not Applicable	Airspace: Not Applicable

Boise AGS (See Chapter 4, Section BO) Scenario B1 = 24 F-35As Scenario B2 = 48 F-35As Scenario B3 = 72 F-35As 18 A-10s remain under Scenario B1; Replace 18 A-10s under Scenarios B2 and B3	Holloman AFB (See Chapter 4, Section HO) Scenario H1W = 24 F-35As Scenario H2W = 48 F-35As Scenario H3W = 72 F-35As	Holloman AFB (See Chapter 4, Section HO) Scenario H1 = 24 F-35As Scenario H2 = 48 F-35As Scenario H3 = 72 F-35As Scenario H4 = 96 F-35As Scenario H5 = 120 F-35As	Luke AFB (See Chapter 4, Section LU) Scenario L1 = 24 F-35As Scenario L2 = 48 F-35As Scenario L3 = 72 F-35As Scenario L4 = 96 F-35As Scenario L5 = 120 F-35As Scenario L6 = 144 F-35As Replace 142 F-16s; 26 FMS F-16s remain	Tucson AGS (See Chapter 4, Section TU) Scenario T1 = 24 F-35As Scenario T2 = 48 F-35As Scenario T3 = 72 F-35As 18 F-16s remain under Scenario T1; 6 F-16s remain under Scenarios T2 and T3
Hazardous Materials and Waste (Corresponds with Chapter 4, Base-Specific Sections 3.15)				
Base • Quantities of hazardous materials and wastes would increase in conjunction with the aircraft increases under Scenarios B1, B2, and B3. • Any new hazardous waste generation points would be managed in accordance with the Boise AGS Hazardous Waste Management Plan. • If F-35A facilities were constructed in an Installation Restoration Program (IRP) site, there is potential for encountering contaminated soil. • Prior to construction, upgrade, or demolition, facilities would be inspected for asbestos-containing material (ACM) or lead-based paint (LBP). If found, ACM and LBP would be disposed of and managed in accordance with applicable Federal, state, and local regulations. Airspace: Not Applicable	Base • Quantities of hazardous materials and waste would increase in conjunction with the aircraft increases under Scenarios H1W, H2W, and H3W. • Any new hazardous waste generation points would be managed in accordance with the Holloman AFB Hazardous Waste Management Plan. • Project area is located near or within Environmental Restoration Program (ERP) site SS-56, and construction excavations have the potential for encountering contaminated soil. • Prior to construction, upgrade, or demolition, facilities would be inspected for ACM or LBP. If found, ACM and LBP would be disposed of and managed in accordance with applicable Federal, state, and local regulations. Airspace: Not Applicable	Base • Quantities of hazardous materials and wastes would decrease under Scenario H1. Quantities of hazardous materials and wastes would increase in conjunction with the aircraft increases under Scenarios H2 through H5. • Any new hazardous waste generation points would be managed in accordance with the Holloman AFB Hazardous Waste Management Plan. • Project area is located near or within ERP site SS-56, and construction excavations have the potential for encountering contaminated soil. • Prior to construction, upgrade, or demolition, facilities would be inspected for ACM or LBP. If found, ACM and LBP would be disposed of and managed in accordance with applicable Federal, state, and local regulations. Airspace: Not Applicable	Base • Quantities of hazardous materials and wastes would not change significantly in the long term. Luke AFB would remain a Large Quantity Generator, pursuant to the Resource Conservation and Recovery Act. • Any new hazardous waste generation or handling areas would be managed in accordance with the Luke AFB Hazardous Waste Management Plan. • If F-35A facilities are located in any ERP sites and excavations are needed during construction or operations, there is potential for encountering contaminated soil. • Prior to construction, renovation, or demolition, facilities would be inspected for ACM or LBP. If found, ACM and LBP would be disposed of and managed in accordance with applicable Federal, state, and local regulations. Airspace: Not Applicable	Base • Quantities of hazardous materials and wastes would not change significantly in the long term. Tucson AGS would remain a Small Quantity Generator, pursuant to the Resource Conservation and Recovery Act. • Any new hazardous waste generation or handling areas would be managed in accordance with the Tucson AGS Hazardous Waste Management Plan. • If F-35A facilities are located in any IRP sites and excavations are needed during construction or operations, there is potential for encountering contaminated soil. • Prior to construction, upgrade, or demolition, facilities would be inspected for ACM or LBP. If found, ACM and LBP would be disposed of and managed in accordance with applicable Federal, state, and local regulations. Airspace: Not Applicable

Note: Not applicable under Airspace indicates the environmental resource does not discuss the areas under the associated airspace because no element of the proposal would result in impacts on these resources under the airspace or ranges.

2.8 Mitigation Measures

Mitigation measures avoid, minimize, remediate, or compensate for environmental impact. Council on Environmental Quality regulations (40 CFR 1508.20) defines mitigation to include the following:

(1) Avoiding the impact altogether by not taking a certain action or parts of an action

(2) Minimizing the impact by limiting the degree or magnitude of the action and its implementation

(3) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment

(4) Reducing or eliminating the impact over time by preservation and maintenance operations during the lifetime of the action

(5) Compensating for the impact by replacing or providing substitute resources or environments

Avoiding, minimizing, or reducing potential impacts have been a priority guiding the development of F-35A basing alternatives and aircraft number scenarios. Mitigation measures are built or designed into the proposed action and alternatives; applied to construction, operation, or maintenance involved in the action; or implemented as compensatory measures. Following the EIS ROD, a Mitigation Plan will be prepared in accordance with 32 CFR 989.22(d). The Mitigation Plan will address specific mitigations identified and agreed to during the environmental impact analysis process.

The understanding of the F-35A aircraft system is an ongoing and dynamic process. The aircraft is at an early stage of overall life-cycle development and data sets as to its performance and other characteristics will undergo change as the aircraft is adapted to the Air Force mission. The current data and knowledge available were considered when identifying possible mitigations. Consequently, as the program evolves, the Air Force's learning curve will evolve and the Air Force will gain a greater understanding of the aircraft's overall performance characteristics.

Subsequent to the F-35A training basing decision, the Air Force will use an adaptive management process to monitor and evaluate the ongoing F-35A Training Program to identify ways to address program-related impacts and manage related issues. Essentially a "predict, mitigate, and implement" environmental management ongoing process that will include ongoing monitoring to determine if the predicted effects were achieved. Monitoring also includes consideration of the effects of potential adaptive measures to allow for mid-course corrections, without requiring new or supplemental NEPA review except where deemed necessary in accordance with 40 CFR §1502.9(c). For example, reviews of operational procedures once the aircraft has beddown, such as those that occur as part of an Air Installation Compatible Use Zone study may identify additional modifications to flight tracks, altitude profiles, engine power settings, or other flight parameters that could lead to noise level reductions.

Subsequent to the basing decision, the F-35A Training Program will be managed in such a way as to allow various alterations as the program matures and new program specifics are learned. New information regarding the F-35A aircraft capabilities, the training syllabus, and the delivery schedule could be used to modify decisions, including those related to operational procedures, source location, and potential noise mitigations. Although every effort will be made by the proponent to fund identified mitigations, application of some proposed mitigation measures may be subject to Congressional appropriations. Mitigations will be developed and described per the requirements of 32 CFR 989.22(d).

2.8.1 Resource-Specific Measures Proposed to Reduce Potential for Environmental Impacts

Specific mitigation measures are presented in Table 2–13. The table identifies proposed measures to reduce the potential for environmental impacts. The table presents the measures by resource area and alternative. Table 2–14 lists mitigation measures that were considered, but not carried forward at this time.

Table 2–13. Mitigation Measures to Reduce the Potential for Environmental Impacts

Resource Area/ Alternative	*Mitigation Measures to Reduce the Potential for Environmental Impacts*
Airspace Management and Use	
All Bases	No Mitigations
Noise	
All Bases	Potential operational modifications to mitigate noise were considered in terms of their effects on safety of flight and negative impacts to training realism. Measures that were considered unsafe by members of the operational community were eliminated from further analysis and not considered as practicable. Further analysis was conducted on those mitigation measures that were theoretically practicable to determine whether substantial noise impacts reductions would result from implementation of the measure and the extent to which the measure would negatively affect training realism and effectiveness. At Boise AGS, mitigations were identified that would be safe, would not drastically reduce training effectiveness, and would deliver reductions in noise impacts. No mitigation measures beyond those already in place at Holloman AFB, Luke AFB, and Tucson AGS were found to be feasible, meaning that the mitigation measures would not be safe, would result in significant reductions in training effectiveness, and/or would not deliver substantial reductions in noise impacts.
Boise AGS (BO 3.2.1.2)	In addition to the mitigations considered collectively for all alternative locations, the following specific mitigations were considered for Boise AGS: • **Modify departure procedure at Boise AGS:** Public comments at hearings and prior experience with F-4 aircraft based at Boise AGS led to the development of mitigations, which could deliver substantial reductions in noise impacts. Mitigations consisted of: 1) An altitude hold whereby a percentage of F-35A training flights departing the AGS would climb from the airfield to an altitude of approximately 1,000 feet (50 percent of departures), 2,000 feet (20 percent of departures), or 3,000 (10 percent of departures), and continue a distance at that altitude before increasing power and climbing to mission altitudes. Twenty percent of departures would conduct unrestricted climb to mission altitude. While hold-downs provide benefits in terms of reduced noise impacts, certain weather conditions are not conducive to hold-downs. 2) A 30-degree turn towards the south during departures could further direct aircraft away from populated areas. 3) All Runway 10 departure operations would be conducted on Runway 10R, which is further from populated areas. The environmental effects of this mitigation scenario would be: • The reduction in power setting and a turn to the southeast substantially reduces noise levels within populated areas as compared to the B1 through B3 scenarios. When the climb is re-initiated, noise levels at two geographically separated areas would be elevated. When compared to the non-mitigated version of the same scenarios, the estimated off-base persons within the 65 dB DNL or greater noise contours reduces from 3,104 to 2,547 for B1, from 5,470 to 3,944 for B2, and from 10,119 to 5,889 for B3. The baseline or No Action Alternative has 142 individuals within the 65 dB DNL or greater noise contours. See Table BO 3.2–2 for unmitigated population impacts. • The outdoor DNL for representative locations around the airfield would typically be reduced by 0 to 7 dB DNL with the mitigated flight operations as compared with the B1 through B3 scenarios evaluated in the Draft EIS (see Table BO 3.2–3 for unmitigated noise levels.). • The number of persons expected to be awakened by training flights would not be appreciably reduced with the flight operation mitigations. This is primarily because late-night flights would continue to occur under the mitigated scenario.

Resource Area/ Alternative	***Mitigation Measures to Reduce the Potential for Environmental Impacts***
	• The number of persons exposed to 80 dB DNL or higher noise levels would reduce from 68 to 2 for B1, from 164 to 57 for B2, and from 313 to 154 for B3. The baseline or No Action Alternative has 0 individuals within the 80 dB DNL or greater noise contour. See Table BO 3.2–4 for unmitigated population impacts. • The noise effects on populations of concern would be reduced under the mitigated scenarios as compared with Scenarios B1 through B3 presented in the Draft EIS. The number of minority persons affected would reduce from 536 to 415 with B1, from 871 to 570 with B2, and from 1,673 to 888 with B3. The number of low-income persons would reduce from 508 to 449 with B1, from 826 to 705 with B2, and from 1,464 to 1,003 with B3 (see Table BO 3.12–2 for unmitigated numbers). The baseline conditions affect 24 minority and 26 low-income residents. • The number of schools affected by noise levels greater than 65dB DNL would not change from the 1 to 2 schools impacted with the mitigated flight operations. The number of child care centers affected by noise levels greater than 65 dB DNL would reduce from 3 to 2 with Scenario B1, from 6 to 2 with Scenario B2 and from 13 to 6 with Scenario B3. • Airspace effects and base effects on other resources such as biological, cultural, soils, transportation, etc. would remain unchanged with the flight mitigations. Land areas exposed to 65 dB DNL would shift from populated areas to unpopulated areas. • Air quality effects for the mitigated flight operations would be comparable to those described for Scenarios B1, B2, and B3. Scenario B3, with or without operational mitigations, would result in emission increases, which could trigger the requirement for a positive general conformity determination before any final decision could be made.
Air Quality	
All Bases	No Mitigations
Safety	
All Bases	No Mitigations
Soils and Water	
All Bases	No Mitigations
Biological Resources (Vegetation and Wildlife, Wetlands and Aquatic Communities and Threatened, Endangered, and Special Status Species)	
All Bases	No Mitigations
Cultural Resources	
All Bases	No Mitigations
Land Use and Recreation	
All Bases	No Mitigations
Socioeconomics	
All Bases	No Mitigations
Environmental Justice and Protection of Children	
All Bases	No Mitigations

Resource Area/ Alternative	*Mitigation Measures to Reduce the Potential for Environmental Impacts*
Infrastructure	
All Bases	No Mitigations
Transportation	
All Bases	No Mitigations
Hazardous Materials and Wastes	
All Bases	No Mitigations

Table 2–14. Mitigation Measures Considered, But Not Carried Forward

Resource Area/ Alternative	*Mitigation Measures Considered, But Not Carried Forward*
Noise	
All Bases	• **Construction of major runway infrastructure**: Construction of new or major improvements to runways was not considered in the initial screening of locations for alternatives in this EIS. F-35A beddown locations were selected based on current infrastructure. Although there are plans for runway improvements at Boise and Tucson, such plans were not included in the initial identification of potential locations to base the F-35A aircraft due to the need to meet the F-35A delivery schedule and were not carried forward for analysis as potential noise mitigations in this EIS. Changes to major runway infrastructure could substantially reduce the number of people affected by elevated noise levels. • **Changing aircraft performance:** Reducing aircraft wing flap settings, delaying flap extension, using unusually high speeds during aircraft landing approaches, or using reduced thrust (i.e. lowering of power settings) are not operationally feasible or safe in a training environment. These unsafe training actions were not carried forward as potential mitigations. • **Reducing the number of late-night operations:** After dark operations between 10:00 p.m. and 7:00 a.m. are needed to accomplish required night training within required time limitations. Student pilot training must continue during summer months, when the sun does not set until relatively late. During these months, some runway approach operations would be conducted after 10:00 p.m. At each potential beddown installation, several operational scheduling factors were considered in estimating the number of late night operations expected to occur. To the extent possible, such scheduling has already been incorporated into the projected flight operations. Scheduling would not be able to further reduce the overall number of late night operations for pilot training. • **Reduced use of afterburners:** Afterburner use during departure is required for heavy aircraft loads that must be carried to accomplish certain training missions. The number of afterburner departures reflects training requirements that would be adversely affected by a reduction in such operations. • **Reduction of the number of practice approaches**: The F-35A training syllabus requires a number of practice approaches to provide a well-rounded and comprehensive training curriculum for student pilots. Reducing the number of practice approaches would not be operationally possible for the production of trained pilots. • **Noise attenuation**: Existing structures can have noise attenuation added by replacing or upgrading individual building components (doors, windows, walls, etc) with components that have an increased ability to absorb or reflect sound energy. The Air Force is not authorized to expend operational funds for off-base structural noise attenuation, nor does it have other mechanisms for increasing structural noise attenuation. Air Force budgeted off-base noise attenuation would not be a practicable mitigation. • **Other adversary aircraft:** Use of an aircraft other than the F-35A as an adversary aircraft during mock engagements or as a chase aircraft during early-syllabus student flights is an option that has been considered. However, the level of use of such assets cannot be accurately predicted at this time. For programmed flying training planning, all support and adversary training aircraft are assumed to be F-35As. • **Auxiliary airfield flight procedures:** Modification of aircraft flight procedures at auxiliary fields is not feasible given the tightly scripted nature of practice approaches. Deviating from standard approach flight tracks would greatly reduce or eliminate the training utility of the practice approaches. • **Additional avoidance areas:** Establishing additional avoidance areas in the training airspace would require additional tasks for training pilots to accomplish during low-altitude flight. New avoidance areas would not be ideal nor advance safety for training pilots. No additional avoidance areas are proposed at this time.

Resource Area/ Alternative	***Mitigation Measures Considered, But Not Carried Forward***
Boise AGS	In addition to the mitigations considered collectively for all alternative locations, the following specific mitigations were considered for Boise AGS: • **Modify Boise AGS approach tracks:** Alternative precision airfield approach methods (e.g., Global Positioning System approach) could allow F-35A precision approach along alternative flight tracks, potentially avoiding overflight of certain densely populated areas. However, no precision approach methods that the F-35A is currently approved to use make use of final approach flight paths that do not follow or nearly follow the extended runway centerline. Modifying approach tracks would not provide substantial reductions in the number of persons affected by noise levels greater than 65 dB DNL. • **Adjust runway usage patterns so that more departure operations are conducted to the southeast:** The majority of departure operations at Boise AGS are already conducted towards the southeast. Further increasing the percentage of total operations made towards the southeast would increase the percentage of runway operations made with a tailwind. Flight operations with a tailwind were not considered operationally feasible or safe in a training environment.
Holloman AFB	In addition to the mitigations considered collectively for all alternative locations, the following specific mitigations were considered for Holloman AFB: • **Restrict flying by modifying flight tracks, runways usage patterns, or other operational parameters:** Much of the area near Holloman AFB is sparsely populated and relatively non-noise sensitive. The White Sands National Monument is already avoided by a specified vertical and horizontal distance during all Holloman AFB flying operations. Modifications to aircraft flight tracks or altitude, engine power, or airspeed profiles would not provide substantial reductions in community noise impacts. • **Conduct larger percentage of required practice approaches at Holloman AFB rather than auxiliary airfields:** Because the area near Holloman AFB is largely unpopulated, high noise levels near the installation affect fewer people than high noise levels near the potential auxiliary airfields of RIAC, El Paso International Airport, or Biggs Army Auxiliary Airfield. Holloman AFB is expected to be operating near full capacity once beddown actions were complete.
Luke AFB	In addition to the mitigations considered collectively for all alternative locations, the following specific mitigations were considered for Luke AFB: • **Modify approach or departure tracks to Luke AFB:** Flight tracks in the vicinity of Luke AFB are limited by rising terrain and Phoenix Sky Harbor Airport airspace which Air Traffic Control uses regularly for transit of aircraft. Maneuvers to the west of the installation are limited by the White Tank Mountains. To ensure safety of flight near an airfield, a minimum distance must be maintained above ground elevation. One procedure that was considered would have added a 10-degree turn towards the west at 2 NM past the runway end while departing towards the south. This potential mitigation was compared with operations presented in the EIS and no substantial noise reduction benefits were achieved compared to standard procedures. • **Implement additional altitude hold-downs during departure:** Aircraft departing Luke AFB are sometimes required by Air Traffic Control to stop climbing temporarily to de-conflict from Phoenix Sky Harbor approach corridors. Adding additional aircraft altitude hold-downs would allow aircraft to reduce engine power setting and noise while near the installation. However, rising terrain near Luke AFB does not permit safe hold-downs at altitudes that would provide substantial noise impact reductions. • **Conduct larger percentage of required practice approaches at Gila Bend AFAF rather than Luke AFB or Aux-1:** Luke AFB makes extensive use of both of its auxiliary airfields to provide the most efficient training. Shifting operations from one location to another would reduce training efficiency, result in potential delays, increase non-productive fuel burn, and shift potential noise impacts from one population to another population. Different use of auxiliary fields was not found to have noise or operational benefits.

Resource Area/ Alternative	*Mitigation Measures Considered, But Not Carried Forward*
	• **Changing percent of operations to the north rather than to the south:** Runway selection at Luke AFB is currently made for safety reasons based on actual or forecasted wind. The most critical phases of flight are takeoff and landing. Normal procedure is to take off and land into the wind so relative groundspeed is reduced and available runway is maximized. The margin of safety is substantially reduced if these operations are conducted with a tailwind where the available runway is minimized and high-energy states increase the likelihood of blown tires and brake fires. Changing training procedures to launch with up to a 10-knot tailwind is not considered acceptable for F-16 pilot training at Luke AFB, and would likewise not be acceptable for F-35A pilot training. Changing runways mid-day requires changing safety barriers with possible delays in aircraft operations. Selection of runway direction for reasons other than wind direction would increase the likelihood of training pilots being forced to accept unsafe tailwind conditions. • **Shift departure operations from Runway 21L to 21R:** Luke AFB has parallel runways. Due to the location of aircraft ramps, aircraft departing Runway 21R would need to taxi further and cross an active runway (Runway 21L) to reach the departure runway. This would result in increased fuel burn, aircraft system heating, and potential for training delays of up to 10 or more minutes as each aircraft waited for a clear runway. Training delays could have far-reaching implications for the overall training schedule once Luke AFB is supporting a large number of assigned aircraft and training time on the munitions training ranges becomes more limited. In addition, shifting departure operations to Runway 21R would require certain second approach operation maneuvers to be conducted to the east rather than the west of the airfield. Such a second approach would expose more people to overflight noise. Shifting departure operations from Runway 21L to 21R would impact flight operations and would not reduce noise levels over populated areas.
Tucson AGS	In addition to the mitigations considered collectively for all alternative locations, the following specific mitigations were considered for Tucson AGS: • **Modify flight tracks or altitude/engine power profiles:** Aircraft arrivals that arrive to Tucson AGS from the north create noise during descent over a densely populated area. Shifting the flight track would not provide meaningful reductions in noise impacts. Departures towards the north are relatively infrequent, but also require flight over densely populated areas, and a shifting of flight tracks provides little noise impact reduction. The area north of Tucson AGS is densely populated for several miles north of the installation. Implementing altitude hold down to the north for purposes of noise mitigation would shift high noise levels to areas further from the airport and not result in reductions in the projected population impacted by noise. • **Conduct larger percent of required practice approaches at Libby AAF:** Under all Tucson AGS F-35A beddown scenarios, the majority of required practice approaches would be conducted at Libby AAF. As with the current F-16 FTU mission, most practice approaches will occur early in the training syllabus and will be conducted at Sierra Vista Municipal Airport. Following initial training, practice approaches drastically decrease in number. Moving these operations to Sierra Vista would increase fuel burn without providing training benefit. • **Further reduce percentage of operations departing towards the north:** Tucson AGS currently conducts a large majority (approximately 90%) of F-16 operations towards the south over areas that are less-densely populated. This trend would continue if the F-35A were to beddown at Tucson AGS. Departure operations are louder than arrival operations. Departure operations to the north are dictated by wind conditions. Reductions in departures to the north would require departing with a strong tailwind that would not be considered safe.

2.9 Management Actions

In addition to mitigations, the F-35A Training Basing EIS has identified a series of management actions to avoid, minimize, or reduce the potential for environmental impact. Many of these management actions are either of a cooperative nature with other stakeholders, such as the FAA and USFWS, permitting actions, which will be implemented in accordance with air and water agencies or specifications incorporated into ground disturbing construction activities. Following each management action, the applicable section of the EIS is presented in parenthesis.

Table 2–15. Management Actions to Reduce the Potential for Environmental Impacts

Resource Area/ Alternative	***Management Actions to Reduce the Potential for Environmental Impacts***
Airspace Management and Use	
All Bases	• Coordinate with the FAA Air Route Traffic Control Centers and other FAA entities to minimize conflicts with civil and commercial aviation. (BO 3.1.1.1, HO 3.1.1.1, LU 3.4.1.1, TU 3.1.1.1) • Avoid airports and airfields underlying military airspace using standard procedures. (Base Specific 2.2)
Noise	
All Bases	• Adhere to all existing FAA, applicable U.S. Fish and Wildlife Service Biological Opinions, and local avoidance procedures, flight restrictions, scheduling adjustments, and other practices designed to reduce aircraft noise. (3.2.1) • Use of flight simulators for some training. (2.4.3)
Air Quality	
All Bases	• Employ fugitive dust control and soil retention practices, including the following: - Use water trucks or sprinkler systems to keep all areas of vehicle movement damp enough to prevent dust from leaving the construction area. (3.3.2) - Suspend all soil disturbance activities when winds exceed 25 miles per hour or when visible dust plumes emanate from the site. (3.3.2) - Designate personnel to monitor the dust control program and to order increased watering, as necessary, to prevent the transport of dust off site. (BO 3.5.1.2, HO 3.5.1.2, LU 3.5.1.2, TU 3.5.1.3)
Safety	
All Bases	Develop F-35A and location-specific emergency fuel dumping procedures based on current aircraft procedures. (BO 3.4.2.2, HO 3.4.2.2, LU 3.4.2.1, TU 3.4.2.1))
Soils and Water	
All Bases	• Sequence construction activities to limit soil exposure so it will not last for long periods. (3.3.2) • Update installation Storm Water Pollution Prevention Plans to reflect new F-35A building construction as required by state and federal Clean Water Act requirements. (BO 3.5.1.2, HO 3.5.1.2, LU 3.5.1.2, TU 3.5.1.3) • Manage onsite storm water and prevent discharges into nearby surface waters through site planning with low-impact design principles and engineered storm water retention ponds (or swales). (3.13) • Install gravel pads at access points for construction area to prevent tracking of soil onto paved roads. (BO 3.5.1.2, HO 3.5.1.2, LU 3.5.1.2, TU 3.5.1.3)

Resource Area/ Alternative	***Management Actions to Reduce the Potential for Environmental Impacts***
Biological Resources (Vegetation and Wildlife, Wetlands and Aquatic Communities and Threatened, Endangered, and Special Status Species)	
All Bases	Avoid spreading invasive nonnative species; preclude vehicles from driving in areas with known invasive nonnative species problems. (3.6.1.1)
Boise AGS	No base specific management actions
Holloman AFB	No base specific management actions
Luke AFB	Maintain overflight altitudes of MSO PACs as stated in informal consultation with USFWS. (LU 3.8.2)
Tucson AGS	No base specific management actions
Cultural Resources	
All Bases	• Continue to avoid, to the extent practicable, identified seasonally sensitive Native American ceremonies or other seasonal activities. (BO 3.9, HO 3.9, LU 3.9, TU 3.9) • Coordinate results of consultation with the State Historic Preservation Office associated with each of the alternative locations: Boise AGS, Holloman AFB, Luke AFB, and Tucson AGS. (BO 3.9.2.2, HO 3.9.2.2, LU 3.9.2.2, TU 3.9.2.2) • Implement tracking of the results of government-to-government consultation with Native American tribes for Boise AGS, Holloman AFB, Luke AFB, and Tucson AGS. (BO 3.9.2.2, HO 3.9.2.2, LU 3.9.2.2, TU 3.9.2.2)
Land Use and Recreation	
All Bases	No management actions
Socioeconomics	
All Bases	No management actions
Environmental Justice and Protection of Children	
All Bases	No management actions
Infrastructure	
All Bases	• Incorporate LEED [Leadership in Energy and Environmental Design] and sustainable development concepts into installation F-35A construction projects to achieve optimum resource efficiency, sustainability, and energy conservation. (BO 3.13.1.2, HO 3.13.1.2, LU 13.1.2, TU 3.13.1.2) • Continue recycling and reuse programs to accommodate waste generated by the F-35A. (BO 3.13.1.2, HO 3.13.1.2, LU 3.13.1.2, TU 3.13.1.2)
Transportation	
All Bases	Reduce any potential congestion associated with the beddown through off base state and local traffic improvement construction projects. (BO 3.14.1.2, HO 3.14.1.2, LU 3.14.1.2, TU 3.14.1.2)
Hazardous Materials and Wastes	
All Bases	Update established procedures and implement updates for managing hazardous materials and wastes associated with F-35A aircraft. By adding new hazardous materials needed by the F-35A program and new satellite accumulation points for hazardous wastes, the Air Force would maintain compliance with state and federal regulations. (BO 3.15.1.2, HO 3.15.1.2, LU 3.15.1.2, TU 3.15.1.2)

2.10 Unavoidable Adverse Impacts

Unavoidable impacts are impacts, which will be experienced as a result of F-35A training basing Unavoidable adverse impacts are significant impacts, which cannot be mitigated to an acceptable level. Multiple potential mitigations have been reviewed, and many of those mitigations and management actions have been adopted, as described in Table 2–1. Other potential mitigations are not practicable or operationally capable of being adopted for F-35A training at alternative bases and are presented in Table 2–2. After the inclusion of mitigations and management actions, a number of unavoidable adverse impacts would still occur. Primarily, such unavoidable adverse impacts would be associated with noise from F-35A flight operations.

No unavoidable adverse impacts would be expected for airspace management and use, air quality (except in the case of B3 which would need a conformity determination), soils and water, vegetation and wildlife, wetlands and aquatic communities, cultural resources, infrastructure, transportation, or hazardous materials and waste. Although there would be an increase in subsonic noise under some of the MOAs, MTRs, and restricted airspaces, it would not be of sufficient magnitude to impact historic properties under the airspaces. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that training flight operations would be unlikely to cause damage. Flare and inert munitions use is not expected to impact historic properties under training airspace. No impacts on historic properties under airspace are expected.

Noise-Related Environmental Consequences: Off-base noise impacts would be unavoidable under all F-35A beddown scenarios. In the case of the Luke AFB alternative, the Arizona State 1988 Joint Land Use Study (JLUS) identified a 65 dB DNL or above high noise area in the proximity of military airports and required real estate transactions to disclose that properties are within the high noise area. In the case of Luke AFB, the 2010 census shows that a calculated 27,545 individuals live outside Luke AFB and within the JLUS high noise area, which surrounds Luke AFB. There would be, for example under L6, 5,340 individuals exposed to the 65 dB DNL or higher noise levels. A calculated 4,591 of those individuals are currently within the high noise JLUS line, and 749 individuals are within the 65 dB DNL contour but outside the JLUS line. Some individuals would experience noise levels of 75 dB DNL or above. For example, of the 5,340 individuals within the L6 65 dB DNL contours, a calculated 41 additional off-base individuals would experience noise levels of 75 dB DNL or above. Individuals within the JLUS line who have acknowledged that they are in a high noise area through real estate transactions and individuals outside the JLUS line who acknowledge in real estate transactions their proximity to a military base would be expected to experience unavoidable adverse impacts from F-35A training operations at Luke AFB and at the Luke auxiliary airfields.

Property valuation is the result of a wide variety of variables, one of which has been identified as airport noise. In the case of Luke AFB, noise-related discounts in property values within the JLUS high noise area would already be discounted by state disclosure requirements regardless of the current noise levels. Properties within the JLUS line are expected to be exposed to 65 dB DNL or greater noise levels. Properties outside the JLUS line, but which are required to disclose proximity to a military base, would also be discounted. There would be no expected change in values for properties within the JLUS line. There could be a small additional discount (less than

0.5 percent per dB DNL) for properties outside the JLUS high noise designation but newly within the L6 65 dB DNL noise contour. These properties could experience an unavoidable adverse impact. Other locations, which could experience unavoidable adverse noise impacts to persons and property, are those near Boise AGS and Tucson AGS. Impacted land uses at Boise AGS, Holloman AFB or Tucson AGS do not have a comparable JLUS line.

Specific off-base locations which currently experience multiple events of 50 dB L_{max} or greater per daytime hour with windows open could experience a noticeable increase in such events per daytime hour. This increase in noise events would be an unavoidable adverse impact.

Off-base residents could be affected by noise levels greater than 80 dB DNL. Persons exposed to noise at greater than 80 dB DNL would have an increased likelihood of experiencing a noise-induced permanent threshold shift (NIPTS). For example, if an individual exposed to noise levels between 82 and 83 dB DNL had an average response to noise, then he or she may experience as much as a 4 dB NIPTS if he or she were to remain in that location every day for 8 hours per day for 40 years outside of his or her residence and be fully exposed to the noise level. If the same individual were to spend the national average percentage of his or her total day indoors (87 percent of the time), then the individual would be expected to experience no more than 1 dB NIPTS. If the individual were particularly sensitive, he or she could experience up to a 9 dB NIPTS if he or she were fully exposed to noise and up to 3.5 dB NIPTS if he or she spends the national average percentage of his or her day indoors. Should a loss of hearing occur over a multi-year period, it would be an unavoidable adverse impact.

Noise-related impacts under the training airspace would consist of subsonic and supersonic noise. Training aircraft would increase subsonic noise under some MTRs, such as under portions of the Holloman AFB training airspace. Where supersonic events would be expected to increase, the percentage of residents under the airspace who are annoyed would be expected to increase. Training at auxiliary fields, such as RIAC, EPIA, or Luke AUX-1, would have an increase of off-installation individuals under 65 dB DNL or above noise contours. The JLUS requirements for property disclosure apply to the Arizona auxiliary fields. Unavoidable noise-related impacts would occur at auxiliary fields and under the training airspace.

Threatened, Endangered, and Special Status Species: All airspace units used for F-35A training are currently used as active military airspace by military jet aircraft; therefore, wildlife and domestic species under these airspaces have previous exposure to military jet overflight, including low-level overflight, subsonic noise, supersonic flight (where approved), defensive countermeasures (where approved), and use of munitions (at approved ranges) that would be associated with the F-35A aircraft.

Although it is possible for a federally listed wildlife species to exhibit a temporary response to a low-level overflight or sonic boom, such as assuming an alert posture, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which “take” occurs (as defined in ESA). The probability of a bird-aircraft strike involving injury to a listed, proposed, or candidate species is so low as to be discountable. Therefore, it is concluded that the project may affect, but is not likely to adversely affect listed or proposed species and would not adversely modify any critical habitat. For example, with regard to the Arizona candidate species including the western yellow-billed cuckoo DPS,

Tucson shovel-nosed snake, and Sonoran desert tortoise, it is concluded that the project may affect but is not likely to contribute to the need for federal listing of these species. The Air Force has submitted these findings and obtained the US Fish and Wildlife Service's concurrence with this determination in compliance with ESA.

Cultural Resources and Native American Consultation: Training aircraft noise levels in Indian Reservations has been the subject of on-going Government-to-Government consultations. For example, those portions of the Tohono O-odham Indian Reservation located underneath military airspace would remain below 65 dB DNL_{mr}, with increases ranging from 0 to 16 dB DNL_{mr} compared to baseline conditions. Portions of the Fort Apache Indian Reservation and San Carlos Indian Reservation would be exposed to noise level increases of 16 dB DNL_{mr}. Although noise levels would remain below 65 dB DNL_{mr}, such increases in DNL_{mr} would be unavoidable impacts.

Land Use and Recreation: Activities under training airspaces would increase in some areas with commercial, industrial, open, recreational, and residential land uses experiencing greater noise levels with the F-35A training. Noise sensitive land uses near the bases that would be exposed to 65 dB DNL and higher would be an unavoidable impact.

Special use land management areas, including National Park Service units, are located beneath training airspace. Increased aircraft operations in these areas have the potential to affect visitor experience and settings of the area. All FAA restrictions in these areas will continue to be followed. Should visitors become annoyed by training aircraft overflight, annoyance would be unavoidable.

Socioeconomics and Environmental Justice: Depending upon the alternative base and aircraft scenario selected, a number of off-base properties near a base could incur property value discounts. Should this occur, it would be an unavoidable adverse impact. Mitigations have been applied to the extent practicable. Even with mitigations, residences, businesses, schools, and child care centers would be affected by noise levels greater than 65 dB DNL. This would be an unavoidable adverse impact.

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Chapter 3

How to Use This Document

Our goal is to give you a reader-friendly document that provides an in-depth, accurate analysis of the Proposed Action, the alternative beddown locations, and the potential environmental consequences for each base. The organization of this Final Environmental Impact Statement (Final EIS) is shown below.

Overall Proposal

Table of Contents, List of Figures, List of Tables, and Acronyms and Abbreviations

Preface: Detailed Guide for Reading the EIS → The Preface provides a detailed guide for reading the EIS.

Chapter 1: Purpose and Need for F-35A Training Basing → Chapter 1 explains the decision made by Congress to provide the U.S. Air Force with a next-generation fighter. Also described are the features of the F-35A, how the F-35A will be based, and how aircrews will train for their operational assignments.

Chapter 2:
- Overview of Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of Proposed Action and Alternatives

→ Chapter 2 provides an overview of the Proposed Action and alternatives, which is to beddown the F-35A at Boise AGS, Holloman AFB, Luke AFB, and/or Tucson AGS.

Chapter 3: Resource Definition and Methodology for Analysis → Chapter 3 defines the environmental resources that could potentially be affected by the Proposed Action and explains the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base Specific Information

Boise AGS	Holloman AFB	Luke AFB	Tucson AGS
Section BO 1.0 Alternative Overview	**Section HO 1.0** Alternative Overview	**Section LU 1.0** Alternative Overview	**Section TU 1.0** Alternative Overview
Section BO 2.0 Base-Specific Project Details	**Section HO 2.0** Base-Specific Project Details	**Section LU 2.0** Base-Specific Project Details	**Section TU 2.0** Base-Specific Project Details
Section BO 3.0 Affected Environment and Environmental Consequences	**Section HO 3.0** Affected Environment and Environmental Consequences	**Section LU 3.0** Affected Environment and Environmental Consequences	**Section TU 3.0** Affected Environment and Environmental Consequences
Section BO 4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section HO 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section LU 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section TU 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources

Overall Proposal

References	List of Preparers	Index	List of Repositories	Glossary	Appendices A, B, and C
Volume 1	Volume 1	Volume 1	Volume 1	Volume 1	Volume 2

DEIS Comments

Appendix D, D.1, D.2, and D.3	Appendix D, D.4 and D.5	Appendix D, D.6, D.7, D.8, and D.9	Appendix D, D.10
Receipt and Locating Comments	Alphabetical Directory	Copies of Letters and Transcripts	Response to Comments
Volume 2	Volume 2	Volume 2	Volume 2

Chapter 3. Resource Definition and Methodology for Analysis

This chapter defines the environmental resources that could potentially be affected by the Proposed Action to beddown, or station, F-35A training aircraft at one or more existing U.S. Air Force (Air Force) or Air National Guard (ANG) bases and explains the methodology used to evaluate the potential impacts. Chapter 4 contains the analyses of potential environmental consequences evaluated by applying the regulations and methodology provided in this chapter for each environmental resource at each alternative base being considered. Parallel environmental resources sections for each base permit rapid comparisons among the bases. For example, Section BO 3.5, which addresses soils and water resources for Boise Air Terminal Airport Air Guard Station (Boise AGS) and its environs, can be compared with soils and water resources at Holloman Air Force Base (Holloman AFB) by turning to Section HO 3.5. Next to each resource area header in this chapter is a cross-reference to the sections within Chapter 4 where these base-specific analyses can be found. For example, the cross-reference following the header for Section 3.5 on soils and water is "Base-Specific Sections 3.5," which encompasses Sections BO 3.5, HO 3.5, and the soils and water sections corresponding to the other bases being considered.

3.1 Airspace Management and Use (Base-Specific Sections 3.1)

Airspace management generally refers to the manner in which the Federal Aviation Administration (FAA), U.S. Department of Defense (DoD), and other responsible agencies coordinate and integrate the use of the nation's navigable airspace so as to ensure all aviation activities are conducted safely and efficiently. The following sections describe how the National Airspace System (NAS) airspace is classified and regulated to meet both military and civil aviation needs.

3.1.1 Regulatory Setting

Navigable airspace is airspace above the minimum altitudes of flight prescribed by regulations under *United States Code* (U.S.C.) Title 49, Subtitle VII, Part A, and includes airspace needed to ensure safety in the takeoff and landing of aircraft (49 U.S.C. 40102). This navigable airspace is a limited natural resource that Congress has charged the FAA to administer in the public interest as necessary to ensure the safety of aircraft and its efficient use (FAA Order 7400.2G 2008) (FAA 2008a). Management of this resource considers how airspace is designated, used, and administered to best accommodate the individual and common needs of military, commercial, and general aviation. The FAA considers multiple and sometimes competing demands for aviation airspace and other special needs to determine how the NAS can best be structured to address all user requirements. While public and private land ownership does not include control of the overlying airspace, management of the navigable airspace also considers, as appropriate, those conditions where flight restrictions or other measures may be needed for avoidance of obstacles and other sensitive land use areas.

The FAA has categorized U.S. airspace as Controlled, Special Use, Other, or Uncontrolled airspace. Controlled airspace is airspace of defined dimensions within which air traffic control (ATC) service is provided to Instrument Flight Rule (IFR) flights and to Visual Flight Rule (VFR)

flights in accordance with the airspace classification. Controlled airspace is categorized into five separate classes: Classes A through E; uncontrolled airspace is designated as Class G. The following extracts from the FAA Aeronautical Information Manual and the Pilot/Controller Glossary addendum to this Manual (FAA 2010) define those airspace categories that are relevant to the affected environment of each alternative base.

Class A airspace, generally, is that airspace from 18,000 feet mean sea level (MSL) up to and including 60,000 feet or Flight Level 600, within which Jet Routes are established. This airspace also includes Air Traffic Control Assigned Airspace (ATCAA), which is normally established over a Military Operations Area (MOA) for higher-altitude training.

Class C airspace, generally, is that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the actual configuration of Class C airspace is individually tailored, it usually consists of a surface area within a 5-nautical-mile (NM) radius from the surface to 1,000 feet above the airport elevation and an outer circle within a 10-NM radius from 1,200 feet to 4,000 feet above the airport elevation (FAA 2008b). The primary purpose of Class C airspace is to improve aviation safety by reducing the risk of midair collisions in the terminal area and enhancing the management of air traffic operations therein.

Class D airspace, generally, is that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and, when instrument procedures are published, the airspace will normally be designed to contain those procedures. Arrival extensions for instrument approach procedures may be designated as Class D or Class E airspace (FAA 2008b).

Class E airspace has several purposes, but those that relate to the alternative bases include controlled airspace around the airfields to protect the instrument approach procedures for those airfields and the airspace in which the Federal Airways used by en route aircraft are established.

Special Use Airspace (SUA) is designated airspace within which flight activities are conducted that require confinement of participating aircraft, or place operating limitations on nonparticipating aircraft. The two types of SUA addressed in this Environmental Impact Statement (EIS) include Restricted Areas and MOAs. Airspace for Special Use includes Military Training Routes (MTRs), which are further designated as Instrument Routes (IR) or Visual Routes (VR), and ATCAA. These airspace units were previously defined in Chapter 2, Section 2.4.4 and Figure 2–1.

Most Restricted Areas are designated joint use, where IFR/VFR operations may be authorized within the airspace by the controlling ATC facility when it is not being utilized by the using agency. MOAs are also considered joint use airspace, where nonparticipating aircraft operating under VFR are permitted to enter a MOA, even when the MOA is active for military use. Aircraft operating under IFR must remain clear of an active MOA unless approved by the responsible ATC agency. Flight by both participating and VFR nonparticipating aircraft is

conducted under the "see-and-avoid" concept, which stipulates that when weather conditions permit, pilots operating VFR are required to observe and maneuver to avoid other aircraft.

MTRs are developed in accordance with criteria defined in FAA Order 7610.4N 2009 (FAA 2009). ATCAAs are contained in Class A and are assigned by ATC for the purpose of providing air traffic segregation between military training activities and other IFR traffic.

The Air Force manages airspace in accordance with processes and procedures detailed in Air Force Instruction (AFI) 13-201, *Airspace Management* (Air Force 2006). AFI 13-201 implements Air Force Policy Directive 13-2, *Air Traffic, Airspace, Airfield, and Range Management* (Air Force 2007a), and DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation and National Airspace System Matters* (DoD 1997). It addresses the development and processing of SUA, and covers aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support Air Force flight operations.

Air Force management of training ranges involves the development and implementation of those processes and procedures required by AFI 13-212, *Range Planning and Operations* (Air Force 2007b) to ensure that Air Force ranges are planned, operated, and managed in a safe manner, that all required equipment and facilities are available to support range use, and that proper security for range assets is present. The overall purpose of range management is to balance the military's need to accomplish realistic testing and training with the need to minimize potential impacts of such activities on the environment and surrounding communities.

3.1.2 Methodology

Potential impacts on airspace use in the airfield environment at each base and the SUA elements were assessed by comparing the projected F-35A and total flight operations, as appropriate, with current baseline conditions. As no modifications or additions are proposed for the current airspace structure at any of the alternative locations, this analysis focused primarily on what effects, if any, F-35A operations may have on airspace use.

3.2 Noise (Base-Specific Sections 3.2)

Noise, which is defined simply as unwanted sound, has the potential to affect several environmental resource areas. Comments received during scoping covered a broad range of issues and requested a comprehensive presentation of noise effects. This section describes noise effects on human annoyance and health and physical effects on structures. Noise impacts on biological, land use, socioeconomic, and cultural resources are described briefly in this section and then discussed in more detail in separate sections dealing with those environmental resources.

3.2.1 Regulatory Setting

Military aircraft noise is not federally regulated. The 1972 Noise Control Act (P.L. 92-574) mandated noise limits on certain categories of equipment, but military weapon systems, including planes, bombs, and artillery, were not classified as equipment as defined in this law. The FAA has regulatory authority for civil aircraft under U.S.C. Title 49, Sections 47501–47533;

however, military aircraft are exempt. The Air Force has decided that military aircraft that are commercial derivatives will comply with the FAA noise level limits to the extent possible. Recent aircraft, such as the KC-135R and C-17, are examples of aircraft that conform to the FAA noise level limits. The Air Force participated in the Federal Interagency Committee on Urban Noise (FICUN) development of guidelines on noise levels and land use compatibility in the vicinity of airfields. Noise impacts are defined based on published noise and land use compatibility guidelines and scientific documents on noise effects.

3.2.2 Methodology

Noise levels associated with baseline conditions and action alternatives in the installation vicinity were estimated using the DoD- and FAA-approved computerized noise models NOISEMAP (Version 7.3) and Integrated Noise Model (Version 7.0b). Subsonic aircraft noise levels in military training airspace units were estimated using the program MR_NMAP, and supersonic levels were estimated using the program BOOMAP. Munitions noise levels were estimated using the program BNOISE2. These models are discussed further in Appendix B. A brief discussion of methods used to communicate noise levels and to assess noise impacts associated with various noise levels is included below.

Several typical F-35A flight profiles for use in environmental impact analysis have been developed through repeated closely measured flight simulator runs. Modeled flight profiles include data on aircraft altitude, engine power setting and air speed at several points along a prescribed flight track. As the F-35A program has evolved and as more flight simulator recorded operational data have become available, representative flight profiles have been refined to more accurately represent actual aircraft configurations that would be used while maneuvering in the airfield environment and while operating on MTRs. This EIS reflects the most up to date set of flight profiles available for the F-35A. F-35A profiles include departure at military engine power (i.e., 100 percent Engine Thrust Request [ETR]), departure using afterburner briefly followed by military engine power, and several initial and second (practice) approaches to the airfield. During approaches, F-35A aircraft maneuver at constant altitude using approximately 25 to 55 percent ETR power or less and descend using approximately 40 percent ETR or less. In the case of practice second approach patterns, aircraft take off from the airfield as if departing, but then maneuver to make another approach to the runway. Flight profiles used in noise modeling at beddown locations were modified as required to follow local course rule constraints and regulations. For example, the altitude at which straight and level portions of maneuvers near the airfield are conducted differs from one airfield to another. The F-35A is generally expected to follow flight tracks similar to those used by currently based aircraft; therefore, the same representative flight tracks used in modeling currently based aircraft were also used in modeling F-35A aircraft. It is important to note that under baseline conditions and beddown scenarios, aircraft vary from flight paths typically used as per Air Traffic Control guidance to avoid other aircraft and for other reasons. NOISEMAP results reflect noise generated by all aircraft operating at the airfield, including several F-35A flight profiles as applied to several representative flight tracks.

Sound levels are measured on a logarithmic decibel scale; a sound that is 10 decibels (dB) higher than another will be perceived as twice as loud. To put other sound levels referenced in this document in perspective, a whisper is typically 20 dB or lower, while a thunderclap can be

120 dB or louder. Sound measurements account for the ability of the ear to hear different frequencies (pitches) of sound by applying frequency weighting. A-weighted levels apply to subsonic aircraft noise and are the best predictor of impacts involving human hearing because they reflect the differing ability of the human ear to hear different frequencies. C-weighted levels apply to sonic booms and other impulsive noises such as thunder, noises that are experienced to a greater extent through the sense of feeling rather than hearing.

Examples of typical A-weighted sound levels of common sounds are shown in Figure 3–1.

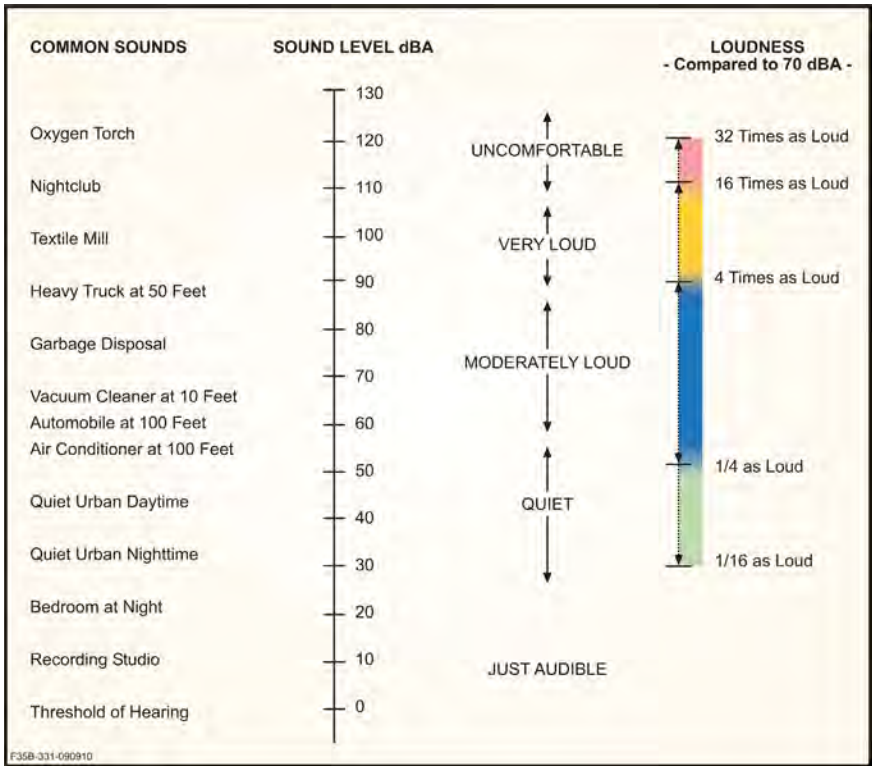

Figure 3–1. Typical A-Weighted Sound Levels of Common Sounds

Several ways of expressing noise levels (known as "metrics") have been developed to quantitatively describe a particular noise or noise environment. Noise metrics used in this analysis are described briefly below (see also Appendix B):

- Day–Night Average Sound Level (DNL) [mathematically denoted as L_{dn}]) is a noise metric combining the levels and durations of noise events and the number of events over a 24-hour period. DNL also accounts for more-intrusive nighttime noise, adding a 10 dB penalty for sounds after 10:00 p.m. and before 7:00 a.m.

- Onset Rate-Adjusted Day–Night Average Sound Level (DNL_{mr}) is the measure used for subsonic aircraft noise in training airspace such as MOAs, ATCAAs, and MTRs. Because the tempo of operations is so variable in airspace units, DNL_{mr} is calculated based on the average number of operations per day in the busiest month of the year. When military aircraft fly low and fast in training airspace, the sound can rise from ambient to its maximum very quickly and the resulting "startle" effect can make the sound seem louder than its un-adjusted sound exposure level would suggest.

DNL_{mr} accounts for the surprise effect of aircraft overflights by adding a penalty of 0 to 11 dB based on the onset rate.

- C-Weighted Day–Night Average Sound Level (CDNL) is a day–night average sound level computed for areas subject to impulsive noise such as sonic booms. Areas subjected to supersonic noise are typically also subjected to subsonic noise, which is assessed based on the DNL_{mr} metric. Peak overpressure, measured in pounds per square foot, is used to characterize the strength of a single impulsive noise such as a sonic boom.

- Maximum Noise Level (L_{max}) is the highest noise level reached during an event, such as an aircraft overflight. Table 3–1 shows maximum sound levels for several representative aircraft at several altitudes in takeoff and landing configuration.

Table 3–1. Representative Maximum Sound Levels

Aircraft (engine type)	***Power Setting***	***Power Unit***	***L_{max} Values (in dBA) At Varying Distances (In Feet)***				
			500	**1,000**	**2,000**	**5,000**	**10,000**
Takeoff/Departure Operations (at 300 knots airspeed)							
F-35A	100%	ETR	124	115.2	105.9	93.5	83.4
F-4C	100%	RPM	117.3	109.7	101.2	88.5	76.9
F-18 E/F	96%	NC	119.7	112.4	104.5	92.4	81.5
A-10A	6200	NF	99.9	91.7	82.2	68.2	57.8
B-1	97.5%	RPM	126.5	118.3	109.9	98.3	88.7
F-15 (P220)	90%	NC	111.4	104.3	96.6	85	74.7
F-16 (P229)	93%	NC	113.7	106.2	98.1	86.1	75.7
F-22	100%	ETR	119.7	112.4	104.6	93	82.9
Landing/Arrival Operations (at 160 knots airspeed)							
F-35A	40%	ETR	101.7	94.8	87.4	76.1	66.2
F-4C	87%	RPM	106.3	99.1	91.3	79.3	68.7
F-18 E/F	84%	NC	113.4	106.2	98.3	86	74.9
A-10A	5225	NF	97	88.9	78.8	60.2	46.4
B-1	90%	RPM	98.8	91.9	84.5	72.8	62
F-15 (P220)	75%	NC	88.5	81.6	74.3	63.2	53.4
F-16 (P229)	83.5%	NC	92.6	85.5	77.8	66.1	55.6
F-22	43%	ETR	111.3	103.9	95.9	83.9	73.1

Key: Engine Unit of Power: RPM=Revolutions Per Minute; ETR=Engine Thrust Request; NC=Engine Core RPM; and NF=Engine Fan RPM.
Source: SELCalc2 (Flyover Noise Calculator), Using NoiseMap 6/7 and Maximum Omega10 Result as the defaults.

- Sound Exposure Level (SEL) accounts for the maximum sound level and the length of time a sound lasts. SEL does not directly represent the sound level heard at any given time. Rather, it provides a measure of the total sound exposure for an entire event as if it were compressed into a single second. For many types of noise impacts, SEL provides a better measure of intrusiveness of the sound than simply stating the maximum noise level reached during an overflight event. Table 3–2 shows sound exposure levels for

several representative aircraft at several altitudes in takeoff and landing configuration. Because SEL compresses noise energy to a standard time period (1 second), all SEL values shown are higher than L_{max} values for the same aircraft.

Table 3–2. Representative Sound Exposure Levels (SEL)

Aircraft (engine type)	*Power Setting*	*Power Unit*	*SEL Values (in dBA) At Varying Distances (In Feet)*				
			500	**1,000**	**2,000**	**5,000**	**10,000**
Takeoff/Departure Operations (at 300 knots airspeed)							
F-35A	100%	ETR	125.0	118.1	110.5	100.5	92.3
F-4C	100%	RPM	121.5	115.7	109.0	98.8	88.9
F-18 E/F	96%	NC	121.6	116.1	110.0	100.3	91.3
A-10A	6200	NF	102.6	96.2	88.5	76.9	68.3
B-1	97.5%	RPM	129.5	123.1	116.5	107.3	99.3
F-15 (P220)	90%	NC	117.3	112.0	106.1	97.0	88.4
F-16 (P229)	93%	NC	116.5	110.8	104.6	95.0	86.3
F-22	100%	ETR	124.2	118.7	112.7	103.5	95.2
Landing/Arrival Operations (at 160 knots airspeed)							
F-35A	40%	ETR	104.7	99.6	93.9	85.1	77.0
F-4C	87%	RPM	113.0	105.9	99.9	90.3	81.5
F-18 E/F	84%	NC	116.4	111.0	104.9	95.0	85.8
A-10A	5225	NF	97.9	91.5	83.3	67.0	55.0
B-1	90%	RPM	103.4	98.3	92.7	83.4	74.4
F-15 (P220)	75%	NC	94.2	89.2	83.6	74.9	66.9
F-16 (P229)	83.5%	NC	97.4	92.1	86.3	76.9	68.2
F-22	43%	ETR	114.9	109.3	103.1	93.5	84.5

Key: Engine Unit of Power: RPM=Revolutions Per Minute; ETR=Engine Thrust Request; NC=Engine Core RPM; and NF=Engine Fan RPM.

Source: SELCalc2 (Flyover Noise Calculator), Using NoiseMap 6/7 and Maximum Omega10 Result as the defaults.

- Onset Rate-Adjusted Sound Exposure Level (SEL_r) is the same as SEL, except that it accounts for the onset-rate of a sound. When military aircraft fly low and fast, the sound can rise from ambient to its maximum very quickly. This rapid onset rate carries a "surprise" effect that can make noise seem louder than its measured SEL would suggest. The calculation for SEL_r has an additional noise penalty programmed into the calculation of up to 11 dB to account for this effect.

- Equivalent Sound Level (L_{eq}) represents aircraft noise levels averaged over a specified time period. L_{eq} is useful for considering noise effects such as those that occur during a typical school day, from 7:00 a.m. to 4:00 p.m. ($L_{eq(SD)}$).

Different metrics can be used to measure different noise impacts. Annoyance represents the most common noise impact. Social surveys have shown a correlation between the percentages of highly annoyed people and the average noise level measured using the DNL metric (CHABA 1981; Fidell et al. 1995a; Schultz 1978; Stusnick et al. 1992). The correlation is lower for predicting the annoyance of individuals, which is not a surprise considering the varying personal factors that influence the manner in which individuals react to noise. Persons with

autism or post-traumatic stress disorder (PTSD), for example, are often very strongly affected by sudden noises (Grandin 1991; Tang et al. 2002; Butler et al. 1990; Morgan et al. 1996). Nevertheless, findings substantiate the claim that community annoyance in response to aircraft noise is predicted using DNL. The findings also demonstrate that impulsive noise as measured in CDNL is annoying to more people than when measured in DNL. The findings of these studies are summarized in Table 3–3.

Table 3–3. Relation Between Noise Level Metrics DNL and CDNL and Annoyance

DNL (dB)	*CDNL (dB)*	*Average Percentage of Highly Annoyed Population*
55	52	3.3
60	57	6.5
65	61	12.3
70	65	22.1
75	69	36.5

Source: CHABA 1981; Finegold et al. 1994; Schultz 1978; Stusnick et al. 1992.

Studies have shown that, at noise levels below 50 dB L_{max}, 90 percent of words are intelligible during the aircraft overflight (Sharp and Plotkin 1984). In this EIS, the number of events per hour exceeding interior noise levels of 50 dB L_{max} are presented for "windows open" and "windows closed" scenarios as a proxy for events with potential to interfere with speech. For this analysis, a typical structure with windows open is assumed to provide 15 dB outdoor-to-indoor noise level reduction; a typical structure with windows closed, 25 dB outdoor-to-indoor noise level reduction.

While the issue of noise impacts on children's learning is not fully settled, the American National Standards Institute (ANSI) has released a classroom acoustics standard entitled *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI S12.60-2009) (ANSI 2009). According to the standard, background noise levels in the classroom for intermittent noise from transportation sources such as aircraft operations should not exceed 40 dB L_{eq} during any hour of the school day. To compare the outdoor noise levels to indoor recommended values, outdoor noise levels are adjusted to account for the noise level reduction provided by the structure. Typical noise level reduction values are 15 dB with windows open and 25 dB with windows closed, but vary by structure, climate, and noise sources. Certain structures, such as those sheathed in brick or incorporating energy-efficient building components, provide greater outdoor-to-indoor noise level reduction, while certain other structures, such as mobile homes, provide less outdoor-to-indoor noise level reduction. It was assumed that each of the schools in the list of sensitive receptors maintains a "windows closed" condition and provides approximately 25 dB of noise level reduction. Therefore, the highest recommended $L_{eq(SD)}$ outside a school would be 64 dB. While this standard is not a requirement for school systems to follow, it is applicable, as a design guideline, to new construction as well as renovations of existing facilities, and is recommended to achieve a high degree of speech intelligibility in learning spaces.

The disturbance of sleep is a concern for communities exposed to nighttime aircraft noise. Quality sleep is a factor in good health and lack of quality sleep has the potential to reduce a person's ability to concentrate. The relationship between noise levels and sleep disturbance is complex and not fully understood. The likelihood of sleep disturbance depends not only on the depth of sleep, but also on the previous exposure to aircraft noise, familiarity with the surroundings, the physiological and psychological condition of the sleeper, and a host of other situational factors. In 1997, the Federal Interagency Committee on Aircraft Noise (FICAN) published a revised relationship between indoor SEL and sleep disturbance (FICAN 1997) based on the findings of three field studies (Fidell et al. 1995a, 1995b; Ollerhead et al. 1992), along with the datasets from six previous field studies. This relationship reflects the upper envelope of the new field data, and should be interpreted as predicting the "maximum percent awakened" by sounds that are new to an area (see Figure 3–2). In July 2008, ANSI and the Acoustical Society of America published a method to estimate the percentage of the exposed population that might be awakened at least once over the course of a night by multiple aircraft noise events based on statistical assumptions about the probability of awakening (or not awakening) (ANSI 2008). The ANSI standard incorporates the results of several sleep disturbance studies of "behavioral awakenings" (i.e., experimental subject pushes a button to indicate having been awakened) associated with noise events in steady state situations where the population has been exposed to the noise long enough to be habituated. The probabilities of being awakened are calculated for each overflight between 10:00 p.m. and 7:00 a.m. (when most people are assumed to be asleep) and summed to yield the overall probability of being awakened at least once per night. Typical residential construction provides structural noise attenuation of approximately 15 dB with windows open and 25 dB with windows closed, and probabilities of awakening were calculated under both "windows open" and "windows closed" conditions.

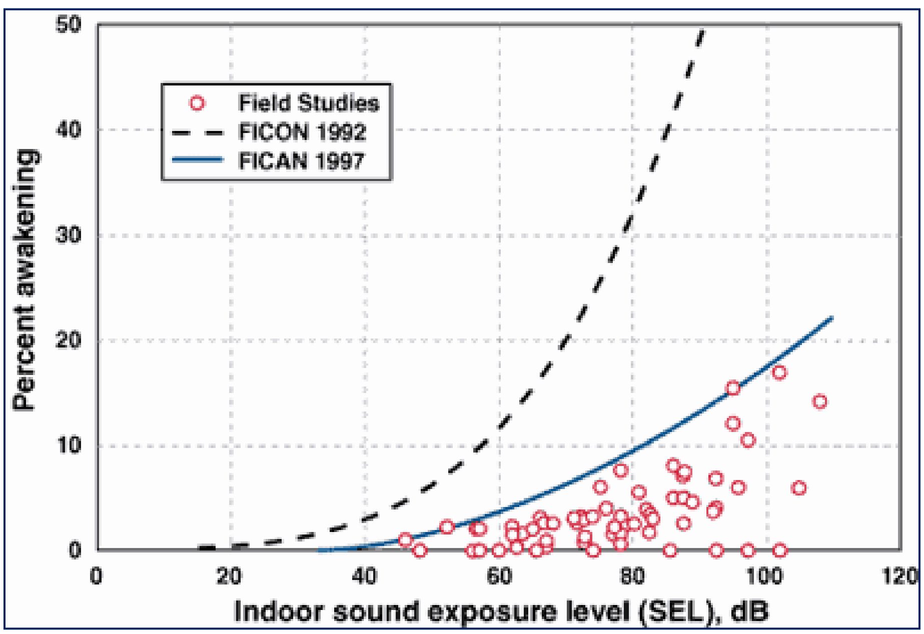

Figure 3–2. Relation Between Indoor SEL and Percentage of Persons Awakened

Certain land uses are more noise-sensitive than others. In 1980, FICUN published guidelines relating DNL to compatible land uses (FICUN 1980). As part of an effort to limit negative effects of noise, the DoD and the FAA have instituted programs that attempt to limit development that would be incompatible with noise, as per the FICUN noise land use compatibility guidelines.

Noise-related hearing loss risk has been studied extensively. Findings of studies and resulting policies and regulations are discussed briefly below and in more detail in Appendix B. As per a DoD policy memorandum published in 2009, populations exposed to noise greater than 80 dB DNL are at the greatest risk of population hearing loss (Undersecretary of Defense for Acquisition Technology and Logistics 2009). The DoD policy directs that hearing loss risk should be assessed using the methodology described in U.S. Environmental Protection Agency (EPA) Report No. 550/9-82-105, *Guidelines for Noise Impact Analysis* (EPA 1982). The EPA's *Guidelines for Noise Impact Analysis* quantify hearing loss risk in terms of noise-induced permanent threshold shift (NIPTS), a quantity that defines the permanent change in the threshold level below which a sound cannot be heard. NIPTS is stated in terms of the average threshold shift at several frequencies that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with the exposure beginning at the age of 20 years and with exposure lasting 8 hours per day for 5 days per week. The actual value of NIPTS for any given person depends on that individual's physical sensitivity to noise—over a 40-year working lifetime, some people will experience more loss of hearing than others. Many people would be inside their homes and would, therefore, be exposed to lower noise levels due to noise attenuation provided by the house structure. A 2-year EPA-sponsored telephone survey of more than 9,000 persons found that the average American spends approximately 87 percent of his or her time indoors (Klepeis et al. 2001). This percentage was found to be fairly constant across the 48 contiguous United States. Table 3–4 shows the "average NIPTS" (10th to 90th percentiles of the exposed population) and the "10th percentile" NIPTS (NIPTS for the most sensitive 10 percent of the population) as a function of DNL if the person is fully exposed to the noise level at his or her residence (i.e., outdoors 100 percent of the time) or if he or she is outdoors for the national average 13 percent of the day. The actual exposure of any given individual to noise depends on factors such as whether a person is at home during the daytime hours (when most flying occurs), which are not known. For the purposes of this study, it was assumed that persons would be at their residences during these hours.

According to the EPA documents titled *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, and *Public Health and Welfare Criteria for Noise*, changes in hearing levels of less than 5 dB are generally not considered noticeable (EPA 1974). There is no known evidence that an NIPTS of less than 5 dB is perceptible or has any practical significance for the individual. Furthermore, the variability in audiometric testing (testing of hearing ability) is generally assumed to be ± 5 dB. The preponderance of available information on hearing loss risk for the adult working population is from the workplace with continuous exposure throughout the day for many years. According to a report by Ludlow and Sixsmith, there were no significant differences in audiometric test results between military personnel who, as children, had lived in or near stations where jet operations were based, and a similar group who had no such exposure as children (Ludlow and Sixsmith 1999). Hence, for the purposes of hearing loss analysis, it could be assumed that the limited data on hearing loss are applicable to the general population, including children, and provide a conservative estimate of hearing loss.

Table 3–4. Estimated Average NIPTS and 10th Percentile NIPTS as a Function of DNL[1]

DNL (dB)	100 Percentage of Time Outdoors		National Average Percentage of Time Outdoors	
	Average NIPTS (dB)[2]	10th Percentile NIPTS (dB)[2]	Average NIPTS (dB)[2]	10th Percentile NIPTS (dB)[2]
80–81	3	7	N/A[3]	N/A[3]
81–82	3.5	8	N/A[3]	N/A[3]
82–83	4	9	1	3.5
83–84	4.5	10	1	4
84–85	5.5	11	1.5	4.5
85–86	6	12	2	5.5
86–87	7	13.5	2.5	6.5
87–88	7.5	15	3	7
88–89	8.5	16.5	3.5	8
89–90	9.5	18	4	9

[1] Relationships between DNL and NIPTS were derived from CHABA 1977.
[2] NIPTS values rounded to the nearest 0.5 dB.
[3] Equivalent exposure noise level is less than 75 dB DNL, below the threshold at which NIPTS has been demonstrated to occur.

Individuals working in known high noise exposure locations on base are subject to the occupational noise regulations in accordance with DoD, Air Force, Occupational Safety and Health Administration, and National Institute of Occupational Safety and Health regulations. These regulations have been developed to reduce the risk of workers developing noise-induced hearing loss. Compliance with the noise exposure limits stated in the regulations may require workers to wear hearing protection.

Non-auditory health effects of long-term noise exposure where noise may act as a risk factor have not been found to occur at levels below those at which NIPTS is a substantial risk. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential non-auditory health effects, at least in workplace conditions. The potential for noise to affect physiological health, such as the cardiovascular system, has been brought up; however, no unequivocal evidence exists to support such claims (Harris 1997). Additional claims that are unsupported include flyover noise producing increased mortality rates, adverse effects on the learning ability of middle- and low-aptitude students, aggravation of post-traumatic stress disorder, increased stress, increase in admissions to mental hospitals, and adverse effects on pregnant women and fetuses (Harris 1997). Research studies regarding the non-auditory health effects of aircraft noise are ambiguous, at best, and often contradictory.

While certain frequencies may be of more concern than other frequencies, conservatively, only subsonic aircraft noise lasting more than 1 second above a sound level of 130 dB is potentially damaging to structural components (CHABA 1977). Sound levels at damaging frequencies (e.g., 30 hertz for window breakage or 15 to 25 hertz for whole-house response) produced by most military aircraft are rarely above 130 dB. Noise-induced structural vibration may also annoy dwelling occupants because of induced secondary vibrations or "rattle" of objects (such as hanging pictures, dishes, plaques, and bric-a-brac) within the dwelling. Sonic booms are commonly associated with structural damage. There is a large degree of variability in damage

experience, and much of the damage depends on the preexisting condition of a structure. At sonic boom overpressures less than 4 pounds per square foot, damage to structures is relatively infrequent. Noise impacts on structures are discussed in greater detail in Appendix B, Noise.

In 1980, FICUN published guidelines relating DNL to compatible land uses (FICUN 1980). Federal agencies have generally adopted these guidelines for their noise analyses, but it is important to note that the guidelines do not constitute a Federal determination that any particular use of land is acceptable or unacceptable under Federal, state, or local law.

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include non-auditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

Many factors affect the market value of real property. While qualities of the property itself, surrounding properties, and the local real estate market are clearly the primary determinants of value, ambient noise levels could also play a role in determining market value. The effect of ambient noise level on real property market value has been studied extensively, but results have been contradictory.

It should be noted that, although the most accurate and up-to-date data available were used as inputs to noise models and the most current impacts analysis techniques have been employed in calculating noise impacts, all results presented in this EIS are estimates. As the F-35A program continues to develop, information on how the aircraft operate will continue to improve. For example, the typical point during departure at which F-35A pilots reduce engine power may change as pilots accrue more experience in the aircraft. However, data presented in this EIS represent an unbiased analysis of impacts using the best data available at the present date in compliance with the requirements of the Council on Environmental Quality (CEQ) and Air Force National Environmental Policy Act (NEPA) regulations.

3.3 Air Quality (Base-Specific Sections 3.3)

Air quality in a given location is defined by the size and topography of the air basin, the local and regional meteorological influences, and the types and concentrations of pollutants in the atmosphere, which are generally expressed in units of parts per million or micrograms per cubic meter. One aspect of significance is a pollutant's concentration in comparison to a Federal and/or state ambient air quality standard. These standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare and include a reasonable margin of safety to protect the more sensitive individuals in the population. The EPA established national standards, the National Ambient Air Quality Standards (NAAQS), which represent maximum acceptable concentrations that generally may not be exceeded more than once per year, except for the annual standards, which may never be exceeded (see Table 3–5).

Table 3–5. National Ambient Air Quality Standards

Pollutant	*Averaging Time*	*National Standards[1]*	
		Primary[2, 3]	**Secondary[2, 4]**
Ozone	8-hour	0.075 ppm (147 µg/m^3)	Same as primary
Carbon monoxide	8-hour	9 ppm (10 mg/m^3)	–
	1-hour	35 ppm (40 mg/m^3)	–
Nitrogen dioxide	Annual	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.10 ppm (188 µg/m^3)	–
Sulfur dioxide	3-hour	–	0.5 ppm (1,300 µg/m^3)
	1-hour	0.075 ppm (105 µg/m^3)	–
PM_{10}	24-hour	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	15 µg/m^3	–
	24-hour	35 µg/m^3	–
Lead	Rolling 3-month period	0.15 µg/m^3	Same as primary
	Calendar Quarter	1.5 µg/m^3	Same as primary

[1] Standards other than those based on annual averages generally are not to be exceeded more than once a year.
[2] Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.
[3] Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
[4] Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
Key: PM*n*=particulate matter with an aerodynamic diameter less than or equal to *n* microns; ppm=parts per million; µg/m^3=micrograms per cubic meter.

Under the Clean Air Act (CAA), state and local agencies may establish air quality standard and regulations of their own, provided these are at least as stringent as the Federal requirements. These state and local standards and regulations are described in detail in Chapter 4 in the base-specific Sections 3.3.

The Federal 8-hour ozone standard is attained when the measured average of the annual fourth-highest daily maximum 8-hour average concentration is less than or equal to 0.075 parts per million. For carbon monoxide and PM_{10}, the Federal standards are not to be exceeded more than once per year. The Federal annual nitrogen dioxide standard is attained when the annual arithmetic mean concentration in a calendar year is less than or equal to 0.053 parts per million. The 1-hour nitrogen dioxide standard is attained when the 3-year average of the 98th percentile of the daily maximum 1-hour average concentration does not exceed 0.10 parts per million. For sulfur dioxide, the primary Federal standard is attained if the 1-hour concentration is less than or equal to 0.075 micrograms per cubic meter. The Federal $PM_{2.5}$ standards are attained when the annual arithmetic mean concentration is less than or equal to 15 micrograms per cubic meter and when the 98th percentile of 24-hour concentration is less than or equal to 65 micrograms per cubic meter.

Ozone concentrations are the highest during the warmer months of the year and coincide with the period of maximum insulation. Maximum ozone concentrations tend to be homogeneously spread throughout a region, as it often takes several hours to convert precursor emissions to ozone in the atmosphere. Inert pollutants, such as carbon monoxide, tend to have the highest concentrations during the colder months of the year, when light winds and nighttime/early morning surface-based temperature inversions inhibit atmospheric dispersion. Maximum inert pollutant concentrations are usually found near an emission source.

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere regulates the earth's temperature. The U.S. Global Change Research Program report, *Global Climate Change Impacts in the United States*, states the following:

- Observations show that warming of the climate is unequivocal. The global warming observed over the past 50 years is due primarily to human-induced emissions of heat-trapping gases. These emissions come mainly from the burning of fossil fuels (coal, oil, and gas), with important contributions from the clearing of forests, agricultural practices, and other activities.

- Warming over this century is projected to be considerably greater than over the last century. The global average temperature since 1900 has risen by about 1.5 degrees Fahrenheit (°F). By 2100, it is projected to rise another 2 ° to 11.5 °F. The U.S. average temperature has risen by a comparable amount and is very likely to rise more than the global average over this century, with some variation from place to place. Several factors will determine future temperature increases. Increases at the lower end of this range are more likely if global heat-trapping gas emissions are cut substantially. If emissions continue to rise at or near current rates, temperature increases are more likely to be near the upper end of the range. Volcanic eruptions or other natural variations could temporarily counteract some of the human-induced warming, slowing the rise in global temperature, but these effects would only last a few years.

- Reducing emissions of carbon dioxide would lessen warming over this century and beyond. Sizable early cuts in emissions would significantly reduce the pace and the overall amount of climate change. Earlier cuts in emissions would have a greater effect in reducing climate change than comparable reductions made later. In addition, reducing emissions of some shorter-lived heat-trapping gases, such as methane, and some types of particles, such as soot, would begin to reduce warming within weeks to decades.

- Climate-related changes have already been observed globally and in the United States. These include increases in air and water temperatures, reduced frost days, increased frequency and intensity of heavy downpours, a rise in sea level, and reduced snow cover, glaciers, permafrost, and sea ice. A longer ice-free period on lakes and rivers, lengthening of the growing season, and increased water vapor in the atmosphere have also been observed. Over the past 30 years, temperatures have risen faster in winter than in any other season, with average winter temperatures in the Midwest and

northern Great Plains increasing more than 7 °F. Some of the changes have been faster than previous assessments had suggested.

- These climate-related changes are expected to continue while new ones develop. Likely future changes for the United States and surrounding coastal waters include more intense hurricanes with related increases in wind, rain, and storm surges (but not necessarily an increase in the number of these storms that make landfall), as well as drier conditions in the Southwest and Caribbean. These changes will affect human health, water supply, agriculture, coastal areas, and many other aspects of society and the natural environment. (USGCRP 2009).

GHGs include water vapor, carbon dioxide, methane, nitrous oxide, ozone, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. The GWP of a particular gas provides a relative basis for calculating its carbon dioxide equivalent (CO_{2e}) or the amount of carbon dioxide that emissions of that gas would be equal to. Carbon dioxide has a GWP of 1, and is, therefore, the standard by which all other GHGs are measured.

The potential effects of GHG emissions from the Proposed Action are by nature global. Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, the GHG emissions from the project alternatives have been quantified to the extent feasible in this EIS for information and comparison purposes.

3.3.1 Regulatory Setting

The CAA and its subsequent amendments establish air quality regulations and the NAAQS and delegate the enforcement of these standards to the states. The CAA establishes air quality planning processes and requires areas in nonattainment of an NAAQS to develop a State Implementation Plan (SIP) that details how the state will attain the standard within mandated timeframes. The requirements and compliance dates for attainment are based on the severity of the nonattainment classification of the area. The following summarizes the air quality rules and regulations that apply to the project actions.

The EPA General Conformity Rule states that a Federal agency cannot issue a permit for or support an activity unless the agency determines that it will conform to the most recent EPA-approved SIP. This means that projects using Federal funds or requiring Federal approval (1) will not cause or contribute to any new violation of an NAAQS, (2) will not increase the frequency or severity of any existing violation, or (3) will not delay the timely attainment of any standard, interim emission reduction, or other milestone. CAA Section 176(c) (42 U.S.C. 7506(c)) and Title 40 of the *Code of Federal Regulations* (CFR), Part 93, Subpart B, implement the EPA General Conformity Rule.

The general conformity rule applies to Federal actions affecting areas that are in nonattainment of an NAAQS and to designated maintenance areas (attainment areas that have been reclassified from a previous nonattainment status and are required to prepare an air quality

maintenance plan). Conformity requirements only apply to nonattainment and maintenance pollutants and their precursor emissions. Conformity determinations are required when the annual direct and indirect emissions from a proposed Federal action that equal or exceed an applicable *de minimis* threshold. These thresholds vary by pollutant and the severity of nonattainment conditions in the region affected by the proposed action.

Requirements for Class I Areas

As part of the Prevention of Significant Deterioration (PSD) Regulation, the CAA provides special protection for air quality and air quality-related values (including visibility and pollutant deposition) in selected areas of the United States (National Parks greater than 6,000 acres or National Wilderness Areas greater than 5,000 acres). These Class I areas are areas where any appreciable deterioration of air quality is considered significant. In 1999, the EPA promulgated a regional haze regulation that requires states to establish goals and emission reduction strategies to make initial improvements in visibility within their respective Class I areas. Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Criteria to determine the significance of air quality impacts within Class I areas usually pertain to stationary emission sources, as mobile sources are generally exempt from permit review by regulatory agencies. However, Section 169A of the CAA states the national goal of prevention of any future impairment of visibility within Class I areas from manmade sources of air pollution. Therefore, due to the proximity of these pristine areas to proposed aircraft operations, this EIS provides a qualitative analysis of the potential for proposed emissions to affect visibility within these areas.

Greenhouse Gases

The EPA has recently promulgated several final regulations involving GHGs either under the authority of the CAA, or as directed by Congress, but none of them apply directly to the Proposed Action. Under the CAA, the EPA has recently promulgated an endangerment finding involving motor vehicle tailpipe emissions of GHGs ("Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act," 74 FR 66496, December 15, 2009) (EPA 2009a); a regulation to control light-duty automobile exhaust emissions of GHGs ("Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards," 75 FR 25324, May 7, 2010) (EPA and DOT 2010); and a tailoring rule establishing PSD thresholds for major stationary sources of GHGs ("Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule," 75 FR 31514, June 3, 2010) (EPA 2010). In addition, as directed by Congress, the EPA promulgated a final GHG reporting rule ("Mandatory Reporting of Greenhouse Gases," 74 Federal Register 56260, October 30, 2009) (EPA 2009b).

In its final endangerment finding, the EPA determined that GHGs threaten the public health and welfare of the American people and that GHG emissions from on-road vehicles contribute to that threat. In the light-duty vehicle rule precipitated by the endangerment finding, the EPA and the Department of Transportation's National Highway Traffic Safety Administration finalized a joint rule to establish a national program consisting of new standards that apply to the manufacturers of model year 2012 through 2016 light-duty vehicles that will reduce GHG emissions and improve fuel economy. As a result of the light-duty vehicle rule, the EPA believed that the tailoring rule for PSD and Title V permitting was necessary.

The tailoring rule is necessary because with promulgation of the GHG rule for light-duty vehicles, PSD and Title V applicability requirements are triggered for stationary sources of GHG emissions as of January 2, 2011. The rule establishes two initial phase-in steps. Step 1 begins on January 2, 2011, and covers only sources and modifications that would otherwise undergo PSD or Title V permitting based on emissions of non–GHG pollutants. No additional PSD permitting actions or Title V permitting will be necessary solely due to GHG emissions during this period. However, a Best Available Control Technology (BACT) review of the GHG emissions may be required if the PSD permit process is under way for non-GHG emissions and the net increase in GHG emissions exceeds 75,000 tons per year CO_{2e}. Sources with Title V permits must address GHG requirements when they apply for, renew, or revise their permits. Step 2 begins on July 1, 2011, and covers new large sources of GHG emissions that have the potential to emit 100,000 tons per year CO_{2e} or more (provided that they also emit GHGs or some other regulated New Source Review pollutant above the 100/250 tons per year [mass-based] statutory thresholds), and modifications at existing sources that increase net GHG emissions by 75,000 tons per year CO_{2e} or more, (provided that it also results in an increase of GHG emissions on a mass basis). GHG emission sources that equal or exceed the 100,000 tons per year CO_{2e} threshold will be required to obtain a Title V permit if they do not already have one.

Under the mandatory reporting rule, fossil fuel and industrial GHG suppliers, motor vehicle and engine manufacturers, as well as facilities that emit 25,000 metric tons or more per year CO_{2e}, will be required to report GHG emissions data to the EPA annually. The first annual reports will cover calendar year 2010 and must be submitted to the EPA in early 2011. Affected facilities were required to have a monitoring plan in place by April 1, 2009.

On February 18, 2010, the CEQ released its *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions* (CEQ 2010), which suggests that proposed actions that would be reasonably anticipated to emit 25,000 metric tons or more per year CO_{2e} should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but rather an indicator that a quantitative and qualitative assessment should be included in NEPA documentation. The purpose of quantitative analysis of CO_{2e} emissions in this EIS is for its potential usefulness in making reasoned choices among alternatives.

3.3.2 Methodology

The air quality analysis estimated the magnitude of emissions that would occur from proposed F-35A construction and operational activities at each base-specific location. The estimation of proposed operational emissions is based upon the net change in emissions between existing aircraft operations and projected F-35A operations.

Air quality impacts from the proposed F-35A alternatives at each base-specific location were reviewed for significance in light of Federal, state, and local air pollution standards and regulations. For the purposes of the project air quality analyses, if project emissions exceeded a threshold requiring a conformity determination in a project region (such as 100 tons per year of carbon monoxide or PM_{10}), further analysis was conducted to determine whether impacts were significant. In such cases, if emissions conform to the approved SIP, then impacts would be less than significant. In the case of criteria pollutants for which a project region is in attainment of

an NAAQS, the analysis used the PSD threshold for new major sources of 250 tons per year of that pollutant as an indicator of significance or non-significance of projected air quality impacts. The analysis also evaluated how proposed emissions would affect air quality within Federal Class I areas that are adjacent to each basing location. Unless otherwise indicated, none of the stationary source modifications would result in the creation of a stationary source which would require a PSD permit in accordance with 40 C.F.R. § 51.166. PSD permitting requirements only apply to stationary sources and the PSD permitting threshold was used as a factor in determining the significance of any emissions increases for each of the alternatives analyzed.

Construction. The beddown of the F-35A at each proposed basing location would require construction and/or renovation of airfield facilities to accommodate the basing decision, including training facilities, hangars, taxiways, and maintenance and fueling facilities. Air quality impacts due to proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and (2) fugitive dust emissions (PM_{10}/$PM_{2.5}$) due to the operation of equipment on exposed soil. Construction activity data developed by Air Force staff were used to estimate proposed construction equipment usages and associated combustive and fugitive dust emissions at each basing location (Air Force 2010d).

Factors needed to derive construction source emission rates were obtained from the *Compilation of Air Pollutant Emission Factors*, AP-42, Volume I (EPA 1995), the EPA NONROAD model for nonroad construction equipment (EPA 2009c), and the MOBILE6.2 model for on-road vehicles (EPA 2003). The analysis reduced fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels to simulate implementation of best management practices for fugitive dust control. These best management practices for fugitive dust control include the following:

1. Use water trucks to keep areas of vehicle movement damp enough to minimize the generation of fugitive dust.

2. Minimize the amount of disturbed ground area at a given time.

3. Suspend all soil disturbance activities when winds exceed 25 miles per hour or when visible dust plumes emanate from the site and stabilize all disturbed areas with water application.

4. Designate personnel to monitor the dust control program and to increase watering, as necessary, to minimize the generation of dust.

Operations. Sources associated with proposed F-35A operations and existing aircraft operations replaced by proposed operations at each basing location would include (1) operations and engine maintenance/testing of aircraft, (2) onsite personally and government-owned vehicle (POVs and GOVs), (3) offsite POV commutes, (4) aerospace ground equipment (AGE), (5) nonroad mobile equipment, and (6) stationary and other sources. Operational data used to calculate projected F-35A aircraft emissions at each basing location were obtained from data used in the project noise analyses (see base-specific Sections 3.2). The operational characteristics of F-35A flight operations are based upon the Karnes 3 flight profiles (Wyle 2011), which include aircraft modes of operation, engine power settings, air speeds, fuel

usages, and flight track distances. Factors used to calculate combustive emissions for the F-35A aircraft are based upon emissions data developed by Pratt and Whitney, with adjustments made by the Joint Strike Fighter Program Office (JSFPO 2011).

Emissions from proposed POV and GOV sources at each basing location were estimated by multiplying emissions from base case operations by the ratio of the proposed F-35A and base case basing populations. Base case equates to baseline or existing conditions evaluated for air quality at each project location and varies somewhat in time. For example, while the air quality analyses use a base case equal to 2009 conditions for most basing locations, 1999 conditions are used to evaluate impacts at Luke AFB because 1999 coincides with the base case conditions used for the most recent federally approved O_3 State Implementation Plan for Maricopa County. Emissions from nonroad and stationary sources at each basing location were estimated by multiplying emissions for each source category due to base case operations by the ratio of proposed F-35A and base case aircraft numbers. Emissions from AGE usages for the F-35A are based upon legacy AGE usages for F-16 aircraft and new AGE usages proposed for the F-35A (JSFPO 2010).

The analysis of proposed aircraft operations is limited to operations that occur within the lowest 3,000 feet (914 meters) of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

3.4 Safety (Base-Specific Sections 3.4)

Safety addresses the ground safety, explosive safety, and flight safety associated with the beddown of F-35A training aircraft. The F-35A will have undergone approximately 10 years of flight testing before regularly operating from any of the bases under consideration for basing training aircraft in this EIS. Ground safety considers issues associated with facility construction/renovation, operations and maintenance activities that support base operations, including fire response and anti-terrorism/force protection measures at each alternative location. Ground safety also considers the safety of personnel and facilities on the ground that may be placed at risk from flight operations in the vicinity of the airfield and in the airspace. Although ground and flight safety are addressed independently, it should be noted that, in the immediate vicinity of the runway, risks associated with safety-of-flight issues are interrelated with ground safety concerns.

F-35A flight risks and safety issues associated with the conduct of aviation activities at the installation and in the airspace are addressed. Any F-35A accident at the airfield would have direct impacts on the ground in the immediate vicinity of the mishap as a result of explosion/fire and debris spread. Class A mishaps and bird–aircraft strike hazards are specifically addressed.

3.4.1 Regulatory Setting

Numerous Federal, civil, and military laws and regulations govern operations at each alternative location and in the surrounding airspace. Individually and collectively they

prescribe measures, processes, and procedures required to ensure safe operations and to protect the public, military, and property.

3.4.2 Methodology

The elements of the F-35A beddown that could potentially affect safety are evaluated relative to the degree to which the action increases or decreases safety risks to the public or private property. Ground, fire, and flight safety are assessed for the potential to increase risk and the capability to manage that risk by responding to emergencies.

Department of Defense Explosives Safety Board Standard 6055.09, *DoD Ammunition and Explosives Safety Standards* (DoD 2005), and Air Force Manual 91-201, *Explosives Safety Standards* (Air Force 2011b), represent DoD and Air Force guidelines for complying with explosives safety. These regulations, as well as AFI 91-204, *Safety Investigations and Reports* (Air Force 2008), identify explosives safety mishaps that involve both explosive and chemical agents. Explosives include ammunition, propellants (solid and liquid), pyrotechnics, warheads, explosive devices, and chemical agent substances and associated components that present real or potential hazards to life, property, or the environment.

Siting requirements for munitions and ammunition storage and handling facilities are based on safety and security criteria. Defined distances are maintained between munitions storage areas and a variety of other types of facilities. These distances, called quantity-distance (Q-D) arcs, are determined by the type and quantity of explosive material to be stored. Each explosive material storage or handling facility has Q-D arcs extending outward from its sides and corners for a prescribed distance. Within these Q-D arcs, development is either restricted or prohibited altogether to ensure personnel safety and to minimize potential for damage to other facilities in the event of an accident. In addition, explosives storage and handling facilities must be located in areas where security of the munitions can be maintained at all times. Identifying the Q-D arcs ensures that construction does not occur within these areas.

Because flight operations would occur where military aircraft currently operate, Air Force accident classifications are utilized in this evaluation.

Air Force defines four categories of aircraft mishaps: Classes A, B, and C, and High Accident Potential (HAP). Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $2 million, destruction of an aircraft, or damage to an aircraft beyond economical repair. Class B mishaps result in total costs between $500,000 and $2 million, permanent partial disability, or inpatient hospitalization of three or more personnel, but do not result in fatalities. Class C mishaps involve reportable damage of more than $20,000, but less than $500,000; a lost workday involving 8 hours or more away from work beyond the day or shift during which it occurred; or occupational illness that causes loss of work at any time. HAP represents minor incidents not meeting any of the criteria for Class A, B, or C mishaps. Class C mishaps and HAP incidents, the most common types of accidents, represent relatively unimportant incidents because they generally involve minor damage and injuries, and rarely affect property or the public. Class A mishaps are of primary concern because of their potentially catastrophic results. Analysis of flight risks correlates Class A mishap rates and bird/wildlife–aircraft strike hazards with projected airfield and airspace utilizations.

3.5 Soils and Water (Base-Specific Sections 3.5)

The term "soils" refers to unconsolidated materials formed from the underlying bedrock or other parent material. Soils play a critical role in both the natural and human environment.

Water resources include surface water, groundwater, and floodplains. Surface-water resources include lakes, rivers, and streams and are important for a variety of reasons, including economic, ecological, recreational, and human health factors. Groundwater includes the subsurface hydrologic resources of the physical environment and its properties are often described in terms of depth to aquifer or water table, water quality, and surrounding geologic composition.

3.5.1 Regulatory Setting

The Clean Water Act (CWA) of 1977 (33 U.S.C. 1251 et seq.) and the EPA Storm Water General Permit regulate pollutant discharges. Pollutants regulated under the CWA include "priority" pollutants, including various toxic pollutants, such as biochemical oxygen demand, total suspended solids, fecal coliform, oil and grease, and pH. Section 404 of the CWA and EO 11990, *Protection of Wetlands*, regulate development activities in or near streams or wetlands. Potential development actions that may affect streams and/or wetlands require a permit from the U.S. Army Corps of Engineers for dredging and filling in wetlands. EO 11988, *Floodplain Management*, requires Federal agencies to take action to reduce the risk of flood damage; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Federal agencies are directed to consider the proximity of their actions to or location within floodplains. Wetlands are discussed in Section 3.6.

With respect to soil erosion, Section 402(p) of the CWA regulates non-point source discharges of pollutants, under the National Pollutant Discharge Elimination System (NPDES) program, or state equivalent program, such as the Arizona Pollutant Discharge Elimination System program. This section of the CWA was amended to require the EPA to establish regulations for discharges from active construction sites. NPDES General Construction Permits require preparation of a Storm Water Pollution Prevention Plan for projects greater than 1 acre.

3.5.2 Methodology

Impacts on soils and surface water can result from earth disturbance that would expose soil to wind or water erosion. Analysis of impacts on soils and surface water examines the potential for such erosion at each installation and describes typical measures employed to minimize erosion. In addition, soil limitations and associated typical engineering remedial measures are evaluated with respect to proposed construction. Flooding impacts are evaluated by determining whether proposed construction is located within a designated floodplain. Groundwater impacts are evaluated by determining whether groundwater beneath the project site would be used for the Proposed Action, and if so, by determining the potential to adversely affect those groundwater resources. Soils and water resource impacts are not evaluated for the areas below the primary use airspace for the F-35A or the auxiliary airfields identified for use by the F-35A because no ground-disturbing activities or use of water resources are at these locations.

3.6 Vegetation and Wildlife; Wetland and Aquatic Communities; and Threatened, Endangered, and Special Status Species (Base-Specific Sections 3.6, 3.7, and 3.8)

Biological resources consist of native and naturalized plants and animals, along with their habitats, including wetlands. In this EIS, biological resources have been divided into three sections: vegetation and wildlife; wetland and aquatic communities; and threatened, endangered and special status species. All three of these resources are governed by similar and related regulations and were analyzed using similar methodologies.

3.6.1 Regulatory Setting

An Act implemented to promote effectual planning, development, maintenance, and coordination of wildlife, fish, and game conservation and rehabilitation in military reservations was approved September 15, 1960 (as amended in 2003), and is commonly referred to as the "Sikes Act." The Sikes Act applies to Federal land under DoD control and requires military services to establish Integrated Natural Resources Management Plans (INRMPs) to conserve natural resources for their military installations. The INRMPs include evaluations of threatened and endangered species, other fish and wildlife resources, wetlands, migratory bird habitat, and forest lands. INRMPs are developed in cooperation with the U.S. Fish and Wildlife Service (USFWS) and state fish and wildlife agencies.

The CWA and the EPA Storm Water General Permit regulate pollutant discharges. Section 404 of the CWA and EO 11990, *Protection of Wetlands*, regulate development activities in or near streams or wetlands. Potential development actions that may affect streams and/or wetlands require a permit from the U.S. Army Corps of Engineers for dredging and filling in wetlands.

The Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531–1544, as amended) established measures for the protection of plant and animal species that are federally listed as threatened and endangered, and for the conservation of habitats that are critical to the continued existence of those species. Federal agencies must evaluate the effects of their proposed action through a set of defined procedures, which can include the preparation of a biological assessment and can require formal consultation with the USFWS under Section 7 of the ESA.

Compliance with the ESA requires communication and consultation with the USFWS in cases where a Federal action could affect listed threatened and endangered species, species proposed for listing, or candidates for listing. The primary focus of this consultation is to request a list of these species that may occur in the region of influence (ROI). If any of these species are present, a determination of the potential effects on the species is made. Should no species protected by the ESA be affected by the Proposed Action, no additional action is required. Letters were sent to the appropriate USFWS offices, as well as state agencies, informing them of the Proposed Action, and requesting data regarding applicable protected species. Appendix A includes copies of relevant coordination letters sent by the Air Force.

The Migratory Bird Treaty Act (16 U.S.C. 703 et seq.) governs potential effects on migratory birds or their active nests, including harm or harassment in the form of actions affecting reproductive success. While all forms of migratory bird "take" are prohibited, some exceptions

for incidental take during military training are allowed under Section 315 of the 2003 National Defense Authorization Act. The Migratory Bird Treaty Act allows the DoD (Military Services) the unintentional take of migratory birds during military readiness activities. The Final Rule was published in the *Federal Register* on February 28, 2007 (USFWS 2007). The measure directs the Armed Forces to assess the effects of military readiness activities on migratory birds, in accordance with NEPA. It also requires the Armed Forces to develop and implement appropriate conservation measures if a proposed action may have a significant adverse effect on a migratory bird population.

In 2006, the DoD and USFWS entered into a Memorandum of Understanding (MOU) to promote the conservation of migratory birds (DoD and USFWS 2006), in accordance with EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. This Executive Order outlines the responsibilities of Federal agencies to protect migratory birds, in accordance with the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, the Fish and Wildlife Coordination Act, ESA, and NEPA. The MOU describes specific actions that should be taken by the DoD to advance migratory bird conservation; avoid or minimize the take of migratory birds; and ensure DoD operations—other than military readiness activities—are consistent with the Migratory Bird Treaty Act. The MOU also describes how the DoD and USFWS will work together cooperatively to achieve these ends.

3.6.2 Methodology

Mapping data for biological resources including vegetation and wildlife; wetlands and aquatic communities; and threatened, endangered, and special status species were obtained from a number of Federal and state agencies, primarily in Geographic Information System (GIS) format. These data were mapped along with proposed project components (bases/airports, auxiliary airfields, and airspace), and acres of vegetation cover types and habitat were calculated in GIS (sources cited where applicable). Impact analyses were conducted using knowledge of wildlife habitat and sensitive species occurrence data, where available, based on where construction-related ground disturbance, airfield operations (takeoffs, landings, engine runups), and activities in airspace and MTRs would occur. Assessing the significance of direct and indirect impacts on biological resources is based on Federal and state determinations of: (1) the importance (legal, commercial, recreational, ecological, or scientific) of the resource, (2) the rarity of a species or habitat regionally, (3) the sensitivity of the resource to proposed construction and training activities, (4) the proportion of the resource that would be affected relative to its occurrence in the region, and (5) the duration of the impact. Federal or state agencies consider impacts on biological resources to be greater if priority species or habitats are adversely affected, if substantial effects occur over relatively large areas, and/or if disturbances cause reductions in population size or distribution of a priority species. Specialists also reviewed many similar regional project documents and used professional judgment in interpreting published findings of experimental and observational studies of overflight effects on wildlife.

3.7 Cultural Resources (Base-Specific Sections 3.9)

Cultural resources are historic districts, sites, buildings, structures, or objects considered important to a culture, subculture, or community for scientific, traditional, religious, or other

purposes. They include archaeological resources, historic architectural/engineering resources, and traditional resources. Only significant cultural resources are considered for potential adverse impacts from an action. Significant cultural resources are those eligible for inclusion in the National Register of Historic Places (NRHP), as set forth in 36 CFR 60.4, or identified as important to Native American or other traditional groups, as outlined in the American Indian Religious Freedom Act; the Native American Graves Protection and Repatriation Act; and Executive Order 13007, *Indian Sacred Sites*. Historic properties are any prehistoric or historic districts, sites, buildings, structures, or objects included or eligible for inclusion in the NRHP because of their historic or cultural significance. For a cultural resource to be considered eligible for the NRHP, it must possess integrity of location, design, setting, materials, workmanship, feeling, or association, and it must meet one or more of the following criteria (36 CFR 60.4):

- Association with events that have made a significant contribution to the broad patterns of our history
- Association with the lives or persons significant in our past
- Distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- Have yielded, or may be likely to yield, information important in prehistory or history

In general, these resources must be more than 50 years old; however, more recent resources may be eligible if they are exceptionally significant.

Section 101(d)(6)(A) of the National Historic Preservation Act (NHPA) states that properties of traditional religious and cultural importance to a Native American tribe or Native Hawaiian organization may be determined to be eligible for inclusion in the NRHP. NRHP Bulletin 38 (NPS 1998) defines *traditional cultural property* (TCP), generally, as one that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community. TCPs can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans and other groups consider essential for the continuance of traditional cultures.

However, properties of traditional religious and cultural importance need not be determined eligible for the NRHP to be a significant cultural resource considered for potential adverse impacts from an action. On November 21, 1999, the DoD promulgated its American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis (DoD 1999). The policy requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Native American and Alaska Native lands, before decisions are made by the services. DoD Instruction 4710.02, *DoD Interactions with Federally-Recognized Tribes* (DoD 2006), implements DoD policy, assigns responsibilities, and provides procedures for DoD interactions with federally recognized tribes

in accordance with its American Indian and Alaska Native Policy and other DoD directives and policies.

Executive Order 13007 defines *sacred sites* as any specific, discrete, narrowly delineated location on Federal land that is identified by a Native American tribe or individual as sacred by virtue of its established religious significance to or ceremonial use by a Native American religion and identified as such to the land managing agency. Executive Order 13007 also requires agencies to accommodate access to, and ceremonial use of, sacred sites by Native American religious practitioners and to avoid adversely affecting their physical integrity.

3.7.1 Regulatory Setting

DoD Instruction 4715.16, *Cultural Resources Management* (DoD 2008b), and AFI 32-7065, *Cultural Resources Management* (Air Force 2004a), outline and specify proper procedures for cultural resource management on Air Force installations.

Laws pertinent to the Proposed Action include the National Historic Preservation Act (NHPA) of 1966, as amended; the Antiquities Act of 1906; the Historic Sites Act of 1935; NEPA; the Archaeological and Historic Preservation Act of 1974; the Archaeological Resources Protection Act of 1979; the Native American Graves Protection and Repatriation Act of 1990; and the American Indian Religious Freedom Act of 1978.

Under Section 106 of the NHPA, the Air Force is required to consider the effects of its undertakings at each alternative location on historic properties listed, or eligible for listing, in the NRHP and to consult with the State Historic Preservation Office (SHPO), Tribal Historic Preservation Office (THPO), and others regarding potential effects as per 36 CFR 800. Under AFI 32-7065, recorded cultural resources not evaluated for NRHP eligibility must be managed as eligible. Under Section 110 of the NHPA, each alternative location is mandated to maintain an active historic preservation program and provide stewardship of cultural resources "consistent with the preservation of such properties and the mission of the agency (Section 470 h-2(a))."

Federal regulations governing cultural resource activities include the following: 36 CFR 800, *Protection of Historic Properties* (incorporating amendments effective August 5, 2004); 36 CFR 79, *Curation of Federally Owned and Administered Archaeological Collections*; 43 CFR 7, *Protection of Archaeological Resources*; 36 CFR 60, *National Register of Historic Places*; and 36 CFR 63, *Determinations of Eligibility for Inclusion in the National Register*. Cultural resource-related Executive Orders that may affect the alternative locations include the following: EO 11593, *Protection and Enhancement of the Cultural Environment*; EO 13007, *Indian Sacred Sites*; EO 13175, *Consultation and Coordination with Indian Tribal Governments*; and EO 13287, *Preserve America*.

3.7.2 Methodology

Impact analysis for cultural resources focuses on assessing whether the Proposed Action or the alternatives have the potential to affect cultural resources that are eligible for listing in the NRHP or have traditional significance for Native American groups. For this EIS, impact analysis for cultural resources focuses on, but is not limited to, guidelines and standards set forth in NHPA Section 106's implementing regulations (36 CFR 800). Under Section 106 of the NHPA, the proponent of the action is responsible for determining whether any historic

properties are located in the area, assessing whether the proposed undertaking would adversely affect the resources, and notifying the SHPO of any adverse effects. An adverse effect is any action that may directly or indirectly change the characteristics that make the historic property eligible for listing in the NRHP. If an adverse effect is identified, the Federal agency consults with the SHPO and federally recognized Native American tribes to develop measures to avoid, minimize, or mitigate the adverse effects of the undertaking.

Analysis of potential impacts on cultural resources considers both direct and indirect impacts.

Impacts may occur through the following:

- Physically altering, damaging, or destroying all or part of a resource
- Altering characteristics of the surrounding environment that contribute to the resource's significance
- Introducing visual or audible elements that are out of character with the property or alter its setting
- Neglecting the resource to the extent that it deteriorates or is destroyed

Direct impacts are assessed by (1) identifying the nature and location of all elements of the Proposed Action and alternatives; (2) comparing those locations with identified historic properties, sensitive areas, and surveyed locations; (3) determining the known or potential significance of historic properties that could be affected; and (4) assessing the extent and intensity of the effects. Indirect impacts occur later in time or farther from the Proposed Action. Indirect impacts on cultural resources generally result from the effects of project-induced population increases, such as the need to develop new housing areas, utility services, and other support functions to accommodate population growth, or increased visitation of a remote area due to improved vehicle access. These activities and the subsequent use of the facilities can impact cultural resources.

A key component of this analysis is defining the area of potential effect (APE), defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR 800.16(d)). For this EIS, the APE defined in each base-specific section includes the installation at which aircraft would be based, the auxiliary airfields used, and the airspace that would be used for pilot training and its underlying land areas.

Archaeological and historic architectural resources at the bases were characterized using existing survey and analysis information from installation cultural resource management plans (CRMPs), historic preservation plans (HPPs), archaeological survey reports, historic buildings survey reports, local histories, and the records of the NRHP and National Historic Landmarks. These documents provided information on known locations of significant resources and identified areas with a high potential for unrecorded cultural resources. Archaeological and historic architectural resources under airspace, which were unlikely to be affected by aircraft overflights (see Appendix B), were characterized using the records of the NRHP and National Historic Landmarks. Relevant SHPOs were also contacted regarding potential cultural resource

concerns for the Proposed Action. NRHP-eligible or -listed properties at each installation are identified in the base-specific sections. Appendix C lists NRHP-listed properties within the APE associated with each installation.

The potential for traditional resources at the bases was identified using CRMPs, HPPs, and information provided by installation cultural resource management staff. The potential for traditional resources under airspace was identified using Bureau of Indian Affairs maps of reservations and Native American lands (BIA 1998). In addition, potentially interested Native American groups were contacted to request information on potential concerns about the Proposed Action.

In this analysis, demolition, construction, and other installation-specific actions needed to support F-35A training, as well as aircraft operations in associated airspace, are part of the alternatives. The assessment of adverse effects takes into account both potential physical damage or destruction of historic properties at the installations and the potential adverse effects of visual intrusions, noise, vibration, and overpressure on historic properties underlying training airspace. Both the type and significance of cultural resources must be considered in assessing potential effects of overflights. Properties eligible for inclusion in the NRHP for their scientific information potential are not adversely affected by the introduction of auditory or visual intrusions. Conversely, if integrity of setting or feeling is an important element of a property's eligibility, that property may be adversely affected by the introduction of auditory or visual intrusions.

There is a body of scientific literature on impacts from all types of noise and vibration (including construction, vehicle traffic, and aircraft overflight) and from overpressure associated with sonic booms (e.g., Battis 1983, 1988; Haber and Nakaki 1989). Most scientific studies of the effects of vibration on historic properties have considered potential impacts on standing architecture; however, some studies of the effects of overflights—both subsonic and supersonic—on archaeological structures and other types of sites also have been published. Two Air Force-sponsored studies have included research into potential effects of supersonic overflight on "nonstructural" archaeology and unconventional structures (Sutherland et al. 1990; Battis 1983).

Induced vibrations from aircraft overflights generating noise levels similar to those generated by the lowest proposed F-35A training were found to be below 1.3 mm/sec, a generally accepted threshold for vibration damage risk in ancient structures, by approximately a factor of two (Battis 1988). In the Battis study, two A-7 aircraft overflew Anasazi ruins at approximately 200 feet AGL and 440 knots. SELCALC indicates that a single A-7 aircraft overflight at high engine power, 200 AGL, and 440 knots generates a maximum noise level of approximately 125 dB; two A-7 overflights occurring simultaneously would generate maximum noise levels up to 3 dB higher, or 128 dB. As noise levels comparable to those generated by the F-35A at its lowest proposed training altitude (500 feet AGL) were found to induce vibrations substantially below the threshold of potential damage, F-35A subsonic noise and vibration would not be expected to result in damage to structures (see Appendix B).

The findings of these and other studies indicate that pilot training in the MTRs, MOAs, and Restricted Areas, and on air-to-ground ranges, will not adversely affect archaeological sites

known or likely to exist in the APE. Given the altitude and speed restrictions on flight training in MTRs and MOAs, historic buildings and structures beneath them also are not likely to be adversely affected (see Appendix B).

Impacts on properties of traditional religious and cultural importance (hereafter referred to as "traditional cultural resources") under airspace can result from noise and visual effects of aircraft overflights on rituals and ceremonies and on wildlife resources.

Ongoing consultation with tribes may identify places of traditional cultural importance or other types of cultural resources that might be adversely affected by auditory or visual intrusions.

3.8 Land Use and Recreation (Base-Specific Sections 3.10)

Land Use

Natural land use classifications include wildlife areas, forests, and other open or undeveloped areas. Human land uses include residential, commercial, industrial, utilities, agricultural, recreational, and other developed uses. Management plans, policies, ordinances, and regulations determine the types of uses that are allowable, and protect specially designated or environmentally sensitive areas.

The attributes of land use addressed in this analysis include the land use regulatory setting, general land use patterns within the installations/airports and in surrounding areas, and Special Use Land Management Areas (SULMAs). SULMA is a term used to categorize types of land uses for analysis purposes and is not an official term used by Federal or state agencies. The regulatory setting includes applicable Federal, state, and local statutes and regulations, plans, programs, and ordinances. General land use patterns address the types of uses within a particular area. SULMAs generally include areas under the airspace, identified by Federal and state agencies as areas to be managed according to established plans and guidelines. SULMAs also include Indian Reservation lands.

Recreation

Recreational resources are outdoor recreational activities that take place away from the residences of participants. This includes public facilities in suburban and urban areas (such as parks, playing fields, amphitheatres, and outdoor sports facilities) and natural areas (such as U.S. Forest Service and U.S. Bureau of Land Management [BLM]-managed land) and associated developed picnic areas, campgrounds, historical and educational sites, and trails that are designated or available for public outdoor recreational use.

3.8.1 Regulatory Setting

Land Use

The regulatory setting for land use includes the key Federal, state, and local statutes, regulations, plans, policies, and programs applicable to land uses on, and in the vicinity of, each primary airfield and, to a lesser degree of detail, the auxiliary airfields. For the purpose of this analysis, the land use discipline assumed Federal noise compatibility requirements identified below, but also addresses state-specific compatibility requirements (e.g., for Arizona) where

applicable, in the section where those military installations are discussed. The specific state and local land use regulations applicable to each airfield are summarized in the base-specific Chapter 4, Sections 3.10.

Federal Interagency Committee on Urban Noise Guidelines for Considering Noise in Land Use Planning and Control (FICUN 1980)**.** In 1979, the FICUN was formed to develop Federal policy and guidance on noise. The committee included the EPA, FAA, Federal Highway Administration, DoD, U.S. Department of Housing and Urban Development, and U.S. Department of Veterans Affairs. The designations contained in the FICUN land use compatibility table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities.

The FICUN guidelines consider areas with noise levels of 75 L_{dn} or greater as unacceptable living environments. Areas between 65–74 L_{dn} are considered "generally unacceptable" for noise-sensitive land uses such as residences, schools, hospitals, and public services. Houses located in areas between 65–74 L_{dn} may not qualify for Federal mortgage insurance without additional costs associated with installing noise attenuation. In the outdoor noise environment, levels greater than 65 L_{dn} may be annoying to some people during communications. Generally, residential development is not recommended in areas experiencing noise levels of 65 dBA or greater. Although discouraged, residential development is compatible within the 65–69 dBA and 70–74 dBA contours, provided noise reduction levels of 25 dB and 30 dB, respectively, are achieved. Commercial/retail businesses are compatible without restrictions up to 69 dBA, and up to 79 dBA, provided that noise reduction levels of 25 dB and 30 dB, respectively, are achieved for public areas. Industrial/manufacturing, transportation, and utility companies have a high noise level compatibility, and therefore, can be located within the higher noise zones.

14 CFR Part 150, Airport Noise Compatibility Planning (1979) (14 CFR 150). Part 150, *Airport Noise Compatibility Planning*, was established under the Aviation Safety and Noise Abatement Act of 1979. It is the primary Federal regulation guiding and controlling planning for aviation noise compatibility on and around civil airports. 14 CFR Part 150 established procedures, standards, and methodologies to be used by airport operators for the preparation of Airport Noise Exposure Maps and Airport Noise Compatibility Programs. The Noise Compatibility Program is a balanced approach for mitigating the noise impacts of airports on their neighbors while protecting or increasing both airport access and capacity as well as maintaining the efficiency of the national aviation system. The regulations contained in 14 CFR Part 150 are voluntary and airport operators are not required to participate. However, an approved Noise Compatibility Program is the primary vehicle for gaining approval of applications for Federal grants for noise abatement projects, and provides the required analyses for evaluating impacts of any proposed constraints upon an airport's operations.

Air Installation Compatibility Use Zone (AICUZ) Program (DoD Instruction 4165.57). DoD Instruction 4165.57 (DoD 1977) establishes the AICUZ Program, which is similar to the FAA's FAR Part 150 Program for civil airports. The AICUZ Program is a DoD program designed to promote compatible land use around military airfields. Implementation of the AICUZ Program

is mandatory for the Military Services; community adoption of resulting land use designations is voluntary. The Services maintain an AICUZ Program to protect the operational integrity of their flying mission.

Bases use the AICUZ Program to provide land use compatibility guidelines for areas exposed to increased safety risks and noise in the vicinity of the airfield. The noise compatibility guidelines recommended in the AICUZ Program are similar to those used by the U.S. Department of Housing and Urban Development, the FAA, and the U.S. Department of Veterans Affairs. The intent of the program is to provide information to surrounding jurisdictions to guide planning and regulation of land use. When noise levels exceed an L_{dn} of 65 dB, residential land uses are normally considered incompatible.

Air Force Comprehensive Planning Program (Air Force Instruction AFI 32-7062). Air Force Instruction 32-7062 (Air Force 1997a) establishes the Comprehensive Planning Program for Air Force installations. The Comprehensive Planning Program is an Air Force discretionary program designed to establish a framework for decisionmaking with regard to the development of Air Force installations. It incorporates Air Force programs such as operational, environmental, urban planning, and others, to identify and assess development alternatives and ensure compliance with applicable Federal, state, and local laws, regulations, and policies.

The General Plan is the only required plan document for completion by all major installations under this instruction. The General Plan is a decisionmakers' summary document that contains text, maps, plan graphics, photographs, and other information, in a condensed format. It provides this information at an appropriate level of detail for the installation, the command, and other decisionmakers to understand the character and structure of the installation and its development potential. The General Plan generally summarizes information from the Component Plans as well as other planning documents. The General Plan can be updated, and provides flexibility in responding to command and installation mission changes.

There are four Component Plans under the comprehensive plan structure: Composite and Constraints and Opportunities, Infrastructure, Land Use and Transportation, and Capital Improvement Plans. The Land Use Component Plan analyzes and identifies the functional relationship of all activities that occur on the installation. It defines the process in arriving at future land use determinations by analyzing planning factors that influence land use compatibility. The document evaluates the relationships between activities and defines their importance in terms of proximity to each other. The culminating product is a future land use plan that defines and governs the growth of the installation. The Land Use Component Plan also integrates public and private plans, projects, and developments that can potentially affect the installation. It analyzes the transportation networks both on and off the installation and arrives at recommendations on traffic movement and road development to improve efficiency.

Governance of Tribal Lands. A Federal Indian Reservation is an area of land reserved for a tribe or tribes under treaty or other agreement with the United States, Executive Order, or Federal statute or administrative action as permanent tribal homelands, and where the Federal Government holds title to the land in trust on behalf of the tribe. Approximately 56.2 million acres are held in trust by the United States for various Indian tribes and individuals. There are

approximately 326 Indian land areas in the United States administered as Federal Indian Reservations (i.e., reservations, pueblos, rancherias, missions, villages, communities, etc.).

Tribes possess the right to license and regulate activities within their jurisdiction, to zone, and to exclude persons from tribal lands. Other types of Indian lands include allotted lands, restricted status lands, and state Indian Reservations. American Indian and Alaska Native tribes, businesses, and individuals may also own land as private property. In such cases, they are subject to state and local laws, regulations, codes, and taxation.

Section 3.7, Cultural Resources, identifies regulations that address required government-to-government consultation between DoD and federally recognized tribes regarding military activities that could affect tribal resources, including lands. Regulations also address how the Federal Government assesses the potential for activities to affect cultural resources that are eligible for listing in the NRHP or have traditional significance for Native American groups.

Additional state and local land use regulations are summarized in the base-specific Chapter 4, Section 3.10.

Recreation

Guidance and recommendations for noise compatibility with some recreational activities is provided in the same guidelines, regulations, and programs described for land use above. There are no specific regulations governing the availability of recreational resources. Under the Federal Land Policy and Management Act, Federal land managers are responsible for preserving and managing public lands for the benefit of the public at large, including access to and enjoyment of public lands for recreational purposes. This requires balancing of uses to meet multiple needs of individuals and national interests.

3.8.2 Methodology

Land Use

The ROI for land use includes the area comprising the primary airfields and the surrounding lands, as well as lands underneath the airspace and in the vicinity of auxiliary airfields.

Primary and Auxiliary Airfields. The methodology for evaluating land use impacts includes: (1) identifying existing land uses and populations in the vicinity of the primary airfields and overlaying baseline noise contours using GIS tools; (2) identifying total acres of land and population in the vicinity of the auxiliary airfields and overlaying baseline noise contours. In addition, on-base land uses are described at a general level of detail taking into consideration that the types of facilities and sizes of proposed construction are known, but not specific locations.

Once these features were identified, the degree to which on-base land uses would be affected by construction was evaluated. The extent to which off-base land uses would be affected was analyzed by determining the acres of each land use and number of people affected by noise impacts related to aircraft for each scenario. The methodology for estimating the affected populations in the vicinity of the primary airfields and auxiliary airfields is provided in Section 3.2, Noise. Additional data were provided to address State of Arizona compatibility

requirements that apply within the state-regulated vicinity of military airports. This entailed evaluating areas within the regulated Joint Land Use Study areas for three airfields with regard to acreage, population, and noise level changes.

For land uses within the vicinity of the primary airfields, the land use analysis utilized GIS data from local jurisdictions. In instances when local GIS data were not available, BLM land ownership data in conjunction with aerial photography were used. BLM-owned land was assumed to be open/agricultural, and privately owned lands were designated as either open or residential based on interpretation of aerial photography. In rare instances where a parcel had not been classified, aerial photography was interpreted to derive a putative land use classification.

To support the comparison of the four primary airfields, land use was classified according to a standardized set of land use classifications that are based on the generalized land use categories described in the Air Force Handbook (AFH) 32-7084, *The AICUZ Program Manager's Guide* (Air Force 1999). Because local land use classifications differ from categories in AFH 32-7084, some aggregation of local land use classifications was required. For example, land use data available at each of the four installations do not support differentiating low-density residential (i.e., less than one dwelling unit per acre), as described in AFH 32-7084, from other residential land uses. Therefore, all residential land uses were aggregated as simply residential for this analysis. As another example, transportation is not specifically listed in the AFH 32-7084 generalized land use categories, but was a predominant feature in land use datasets provided by localities. In instances such as this, where the description of generalized land use types in AFH 32-7084 did not specifically state a land use type included in local land use data, the most appropriate land use was selected. Transportation is similar to open and agricultural in terms of having relatively low noise sensitivity and similar noise compatibility criteria in the standard Air Force land use compatibility matrix and was aggregated with open and agricultural in this analysis. Descriptions of the land use categories used in this analysis include:

- Residential: All types of residential activity, such as single- and multi-family residences, and orphanages.
- Commercial: Wholesale or retail establishments including offices, retail establishments, restaurants, hotels, and motels. For this analysis, airports other than the airport proposed for F-35A beddown, were classified as commercial.
- Industrial: Manufacturing, warehouses, and other similar uses.
- Public/Quasi-Public: Publicly owned lands and lands open to public access; including military reservations, prisons, public buildings, schools, churches, non-residential charitable establishments, cemeteries, and medical facilities (unless medical care is provided in home, in which case the land use was classified as residential).
- Recreational: Land designated for recreational activity, including parks, golf courses, and wildlife and nature areas.
- Open, Agricultural, Resource Extraction, and Transportation: Open refers to undeveloped land. Agricultural lands include cropland, grazing lands, and livestock

production. This land may include single-family residences located within an agricultural parcel, where the residence is the primary residence for persons engaging in agriculture. Resource Extraction includes such activities as mining or quarrying. Transportation includes roads, railroads, and other linear ground transportation infrastructure.

Other data sources for the land use analysis included existing environmental studies and reports, field visits, and personal communications. Descriptions of general land use patterns and land management practices at the primary airfields were based on materials presented in installation and airport planning documents, such as base general plans and airport master plans. For land use within the vicinity of the primary airfields, comprehensive plans and general plans prepared by local jurisdictions were described. This was also done at a lesser level of detail for auxiliary airfields. These plans are summarized in the base-specific Chapter 4, Sections 3.10.

Training Airspace. To evaluate land uses underlying the airspace, SULMAs were initially identified by using the Environmental Systems Research Institute (ESRI) Federal lands datasets (ESRI 2009) and also the Managed Areas Database (MAD) (Managed Areas Database 1996). The ESRI Federal lands dataset identified lands administered by various Federal agencies such as the U.S. Forest Service and USFWS, National Parks, and National Monuments, Wilderness Areas and Federal Indian Reservation lands held in trust by the Bureau of Indian Affairs. The MAD dataset was filtered to show items at a state or local level because Federal lands were already covered in the ESRI dataset. Examples of land included in the MAD dataset are state and local parks and state wildlife refuges. Wilderness Study Areas (WSAs) in New Mexico were left out of the ESRI Federal lands dataset but were included in the MAD dataset. Due to comments received on the Draft EIS, datasets for the units administered by the National Park Service (NPS 2012) and for the Wilderness Areas and WSAs of the Idaho BLM (BLM 2011a, BLM 2011b) were acquired from the managing agencies. These datasets replaced the information in the ESRI and MAD datasets on National Park units and the BLM Wilderness Areas and WSAs in Idaho.

The area of each SULMA was calculated using GIS to determine the acreage below the airspace units. If a SULMA consisted of more than one part (i.e., polygon), the areas were totaled so that calculations used the entire area. Airspace units were "intersected" with the land use SULMA layers to indentify the overlap with the SULMAs and the percentage of overlap was calculated. Airspace units were calculated individually because some MOAs, MTRs, Ranges, and restricted airspaces overlap each other. The affected SULMAs were exported in a tabular format listed by airspace unit.

How the SULMAs would be affected by the various scenarios was evaluated by reviewing projected levels and changes in noise compared to the baseline scenario for three noise metrics: subsonic noise (DNL_{mr}) and supersonic noise (CDNL and the daily number of sonic booms).

Note that in the discussion of impacts on SULMAs, Wilderness Areas are considered particularly sensitive to noise increases due to wilderness characteristics and goals described in the Wilderness Act, including, for example, "naturalness" and in some cases, "outstanding opportunities for solitude." WSAs differ from Wilderness Areas because the former have been

determined to have wilderness characteristics, but Congress has not yet decided whether they will become Wilderness Areas or be released for non-wilderness uses. WSAs are managed to achieve "non-impairment" of wilderness characteristics but may include temporary uses not allowed in Wilderness Areas.

Recreation

The ROI for recreation includes the area comprising the primary airfields and the surrounding lands, as well as lands underneath the airspace and in the vicinity of auxiliary airfields.

Evaluation of recreational resources considers whether proposed changes would preclude, displace, or alter the suitability of an area or facility for ongoing or planned recreational uses. This could be triggered by changes in noise, access, visual context, availability of recreational sites, or change in the desired qualities of an area that contribute to recreational opportunity. The analysis also considers the relative importance of the affected resource. This is a qualitative assessment of its value based on popularity/visitation, management goals, and availability of similar recreational opportunities.

Primary and Auxiliary Airfields. For the area surrounding airfields, the following are considered:

Effects of changes in noise levels and activity by aircraft operations at airfields on surrounding outdoor recreation or facilities. The analysis uses the FAA's recommended land use compatibility average sound levels (see Table 3–6) for various recreational facilities, activities, and events as the basis for evaluating impacts. Also considered are the degree of change in noise exposure, change in frequency of operations, and the time of day. Changes of more than 3 dB DNL over current levels are usually noticeable to persons familiar with the local context.

Effects from noise and dust or changes in visual context from construction on outdoor recreation activities or facilities. The analysis considers the distance of potential construction areas from recreational sites, and the relationship and appearance of new facilities relative to surrounding recreational areas and uses.

Effects of increased personnel and family members on local recreational resources surrounding the primary staging base. The analysis considers the relative change in population resulting from the action in the given community and the degree to which this could affect the capacity of local recreational resources to serve area residents.

Table 3–6. Recreational Land Use Compatibility with Yearly Day–Night Average Sound Levels

Recreational Land Use	Yearly Day–Night Average Sound Level (L_{dn}) in Decibels					
	< 65	65–70	70–75	75–80	80–85	> 85
Outdoor sports arenas and spectator sports	Y	Y[1]	Y[1]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusement parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Y Land use and related structures are compatible without restrictions.
N Land use and related structures are not compatible and should be prohibited.
25, 30 Land use and related structures generally compatible; recommend noise level reduction (outdoor to indoor) of specified dB through incorporation of noise attenuation in structures.
[1] Land use compatible, provided special sound reinforcement systems are installed.

Training Airspace. The analysis of potential effects of noise caused by military aircraft in training airspace on regional recreational resources considers the noise sensitivity of affected recreational sites or settings, degree of change in noise exposure, frequency of operations, altitudes of overflights, and time of day. Also considered is the relative popularity and value of recreational activities and opportunities for residents and visitors/tourists within the context of the region. The analysis emphasizes the potential change in noise exposure on areas that are relatively pristine or quiet. The analysis addresses increases in sound levels of specific events and sonic booms, which can be startling to persons in outdoor settings.

Typical effects from aircraft noise on recreational uses are provided below, and could result under any of the scenarios evaluated in this EIS. Most impacts result from specific events affecting persons engaged in a recreational activity at a particular time. The varying levels of operations under the scenarios may increase the potential for effects from single events. The following paragraphs provide a review of the multiple considerations and the relativity of a noise-driven impact assessment on recreation.

Noise from aircraft operations can change the context in which recreation is undertaken. Recreational opportunity is classified by BLM partially by the type of challenge afforded to participants. One of the opportunity factors is degree of isolation and remoteness. Quiet and naturalness is an intrinsic part of remote recreational experiences. Changes to quiet settings could affect the spectrum of recreational opportunities and the quality of the experience in an area or region, but is not expected to change recreational use of the area. People's reactions to noise in recreational settings vary. A study by the U.S. Forest Service found that visitors to wilderness areas did not generally notice high-altitude aircraft noise intrusions, although startle effects from low-flying high-speed aircraft were noticed and reported as annoying by some visitors (USFS and NPS 1992). According to National Park Service publication *Report on Effects of Aircraft Overflights on the National Park System, Report to Congress* (NPS 1994), natural quiet is an important part of visitor experiences and a reason for visiting national parks and monuments for about 91 percent of persons surveyed. Increased airspace use over National Park Service units has the potential to impact visitor experience and the setting and feeling of the areas.

Visitors have varying perspectives on whether aircraft overflights are a positive or detrimental factor to their outdoor experience. For example, some outdoor sporting participants generate localized noise through the use of vehicles and mechanical equipment (such as portable generators). Others seek a more natural experience on foot away from vehicles. Reactions vary depending upon individual expectations and the context in which aircraft-caused noise occurs. These incidences are not likely to be persistent and would have only temporary impacts on any given experience. These events are not expected to change visitor habits or recreational land uses overall, but intermittent overflight during individual recreational events could annoy some affected participants.

A common concern is the potential for noise to interfere with hunting activities. A sudden low-level overflight could startle an animal and a hunter preparing to shoot. Some animals or birds (such as pheasants and sage grouse) may be susceptible to noise and scatter when a sudden loud noise occurs. This interference may be annoying and degrade the quality of the outdoor experience for some hunters. While these isolated events can happen, behavior of game animals and their reproduction and populations are not significantly affected by noise (see Chapter 4, Section BO 3.2). Higher noise levels are not expected to noticeably reduce populations of popular game species and negatively impact hunting (see Chapter 4, Section BO 3.6). Hunting is a viable local land use under much of the training airspace in Idaho, Washington, and Wyoming. Hunting can and does coexist with infrequent and random low-level military overflights, but this does not reduce the perceived significance of the impact on residents or visitors to this area.

Startle effects can also cause a safety risk for rock climbing or other physically challenging tasks requiring a high degree of concentration. For example, some popular areas for rock climbing are located in southwestern Idaho. Locations where training is performed on weekends would have higher potential to affect recreation, as this is the time when most recreation activity takes place. The F-35A is normally flown at higher altitudes than other fighter aircraft to perform its air-to-ground mission. Considering this, intrusion from high-altitude operations of the F-35A is less likely to cause startle effects on users of quiet recreational settings.

The noise effect of sonic booms could similarly disrupt or startle persons in outdoor settings. Even very infrequent sonic booms may cause annoyance for recreational activities where quiet is desirable, such as remote hiking, camping, and hunting. Because of their infrequency, sonic booms may be startling but should have a minimal effect on the overall quality of recreational opportunities or experiences. Sonic booms can startle animals and could cause a horse or pack animal to bolt or react. This could result in infrequent accidents. There is no way to specifically avoid a location from experiencing a sonic boom if aircraft are performing supersonic maneuvers in an overlying, or even nearby, MOA or ATCAA.

The interface between military aircraft and recreational use of airspace for flying, parasailing, gliding and ballooning is an air safety concern. Because the F-35A would use existing military training airspace, these activities would already be known or identified with appropriate avoidance procedures or local protocols. An increase in military use could affect the availability of airspace for recreational uses in some locations.

3.9 Socioeconomics (Base-Specific Sections 3.11)

Socioeconomics refers to features or characteristics of the socioeconomic environment: employment, earnings, population, and housing. The most recently published data were used for the analysis and the time period is specified for each resource. The majority of impacts associated with implementation of the proposed alternatives are likely to occur within a circumscribed geographical area. These specific areas are identified for each respective military installation and are composed, for the most part, of single or multiple counties and communities within them.

3.9.1 Regulatory Setting

Socioeconomics does not have an applicable regulatory setting.

3.9.2 Methodology

The socioeconomic analysis focuses on the effects resulting from the incoming personnel, as well as construction programs under each alternative and F-35A aircraft scenario. The incoming personnel and construction activities contribute additional income and new demands for products and services into the local economy that would lead to additional population growth, employment growth, greater earnings, and increased demand for public services. The net change for each socioeconomic indicator is compared to the existing conditions in the ROI to identify the intensity of the effects. The magnitude of these effects is estimated through economic impact analysis, which models the relationship between industrial sectors and household expenditures.

The economic impact analysis was conducted using the Impact Analysis for Planning (IMPLAN) economic forecasting model. The IMPLAN model uses data from the U.S. Bureau of Labor Statistics and the U.S. Bureau of Economic Analysis to construct a mathematical representation of a local economy using region-specific spending patterns, economic multipliers, and industries. In this analysis, the IMPLAN model provided representations of the county-wide economy at each alternative location. Economic impacts are analyzed by introducing a change to a specific industry in the form of increased employment or spending; the IMPLAN model mathematically calculates the resulting changes in the local economy. In this analysis, the IMPLAN model estimates the economic effects of the incoming personnel on spending and employment in the established ROI. The economic impact analysis separates effects into three components: direct, indirect, and induced. Direct effects are the additional employment and income generated directly by the expenditures of the incoming personnel. To produce the goods and services demanded by the incoming personnel, businesses, in turn, may need to purchase additional goods and services from other businesses. The employment and incomes generated by these secondary purchases would result in the indirect effects. Induced effects are the increased household spending generated by the direct and indirect effects. The total effect from the economic impact analysis is the total number of jobs created throughout the ROI by the direct, indirect, and induced effects.

To estimate the change in population from the F-35A beddown, the Air Force assumed that the F-35A personnel, with the exception of the F-35A students, would be accompanied by

approximately 2.2 dependents each, including spouses and children. Because individual F-35A students would be in the area for less than a year as training rotates, the Air Force assumed that the F-35A students would not be accompanied by dependents.

Potential impacts on schools are evaluated by estimating the number of school-aged dependents accompanying military members and assessing the capacity of the schools using state-mandated maximum class sizes, or average class sizes within the school district if there is no state mandate. Potential impacts on public services are evaluated by estimating the additional number of law enforcement, firefighters, or medical services to maintain the existing level of service following an increase in the ROI's population. These analyses are estimates of potential impacts and are not indications of requirements. The capacity of schools and availability of public services are subject to the availability of tax revenues and other local economic conditions.

Socioeconomic analysis of noise generated by the F-35A in the vicinity of the main airfield and auxiliary airfields and beneath the airspace focuses on noise levels greater than 65 dB DNL in the vicinity of airfields and greater than 55 dB DNL_{mr} in the airspace. The EPA has identified a DNL of 55 dB to be a level protective of the public health and welfare. This represents a threshold below which adverse noise effects are generally not expected. The FAA and DoD have identified residential use as incompatible with annual noise levels above 65 dB DNL unless special measures are taken to reduce residential interior noise levels. Residential use is identified as incompatible regardless of noise attenuation at noise levels greater than 75 dB DNL (see Appendix B).

There are a number of factors that affect property values that make predicting impacts difficult. Factors directly related to the property, such as size, improvements, and location of the property, as well as current conditions in the real estate market, interest rates, and housing sales in the area, are more likely to have a direct adverse impact on property values. Several studies have analyzed property values as they relate to military and civilian aircraft noise. In one study, a regression analysis of property values as they relate to aircraft noise at two military installations was conducted (Fidell et al. 1996). This study found that, while aircraft noise at these installations may have had minor impacts on property values, it was difficult to quantify that impact. Other factors, such as the quality of the housing near the installations and the local real estate market, had a larger impact on property values. Therefore, the regression analysis was not able to predict the impact of aircraft noise on the property values of two comparable properties.

Another study analyzed 33 other studies attempting to quantify the impact of noise on property values (Nelson 2003). The result of the study supports the idea that the potential for an adverse impact on property values as a result of aircraft noise exists and estimates that the value of a specific property could be discounted between 0.5 and 0.6 percent per decibel when compared to a similar property that is not affected by aircraft noise. Additional data indicate that the discount for property values as a result of noise would be higher for noise levels above 75 dB DNL.

3.10 Environmental Justice and Protection of Children (Base-Specific Sections 3.12)

Environmental justice refers to the evaluation, in accordance with requirements of Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, and Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, of the potential for disproportionate impacts on minority and low-income populations and children from the F-35A training beddown. Minority populations include all persons identified by the 2010 census to be of Hispanic origin, regardless of race, and all persons not of Hispanic origin other than White (i.e., non-Hispanic persons who are Black, American Indian, Eskimo or Aleut, Asian or Pacific Islander, or other race).

The 2010 census did not collect information on income or poverty levels. The U.S. Census Bureau now collects and releases data on poverty through the American Community Survey as 5-year estimates down to the census tract level. The latest American Community Survey was released in 2010, providing estimates based on 2005–2009 data. Low-income populations include persons living below the poverty level ($21,954 for a family of four in 2009, adjusted based on household size) as reported in the 2005–2009 American Community Survey by the U.S. Census Bureau. The percentage of low-income persons is calculated as a percentage of all persons for whom the Census Bureau determines poverty status, which is generally a slightly lower number than the total population, as it excludes institutionalized persons, persons in military group quarters and in college dormitories, and unrelated individuals under 15 years old. For the purposes of this analysis, the low-income populations in the 2005–2009 American Community Survey estimates are evaluated to the census tract level for the percentage of low-income persons in the affected 2005–2009 estimated population. That percentage is then applied to the affected 2010 population as an estimate of the number of low-income persons affected under the 2010 census. For the purposes of this analysis, children are defined as persons age 17 and younger, as enumerated by the 2010 census.

3.10.1 Regulatory Setting

The objectives of EO 12898 include identification of disproportionately high and adverse health and environmental effects on minority and low-income populations that could be caused by a proposed Federal action. Accompanying EO 12898 was a Presidential Transmittal Memorandum that referenced existing Federal statutes and regulations, including NEPA, to be used in conjunction with the Executive order. The CEQ issued environmental justice guidelines under NEPA in December 1997 (CEQ 1997). Air Force guidance for implementation of the Executive Order is contained in the *Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process*, dated November 1997 (Air Force 1997b). The Federal Government maintains a government-to-government relationship with many Native American tribes. Therefore, Native American populations may in some cases be addressed separately in the environmental justice analysis, in addition to being included in data that identify minority populations. The objectives of EO 13045 include identification and assessment of environmental health risks and safety risks caused by a Federal action that may disproportionately affect children.

3.10.2 Methodology

The demographic profile of the region provides the context within which the environmental justice analysis was conducted. In order to determine whether or not environmental impacts would disproportionately affect minority or low-income populations, it is necessary to establish an appropriate basis of comparison. This basis is the "community of comparison," which consists of the geopolitical units that encompass the noise impact footprint of the proposed project. The environmental justice analysis, therefore, used this community of comparison to define the affected area. Most environmental effects from the alternatives are expected to occur within areas encompassing the base and other lands under the airfield noise contours. Noise impacts within the primary training airspace associated with each of the beddown alternatives were also considered. If there was a potential increase in the number of persons adversely affected by the 65 dB DNL and above noise contour in the vicinity of the main airfield or auxiliary airfield, then a more-detailed evaluation was done for environmental justice. For the primary airspace, including MTRs, if noise levels increased above 65 dB DNL_{mr} or experienced a substantial change in noise levels, a more-detailed evaluation was done for environmental justice. This included estimating the percentage of minority persons affected by the increased noise and the percentage of low-income persons affected. A comparison was then made between these percentages and the ones previously calculated for the community of comparison to determine if there is a disproportionate effect under the noise contour due to the proposed activity.

Population estimates for geographic areas underlying the airfield noise contours (i.e., for existing and proposed conditions) were calculated using data from the 2010 census and the 2005–2009 American Community Survey estimates, as described above. Data for variables including total population, race, ethnicity, and poverty status were developed for the areas beneath the 65 dB DNL and above noise contours or the primary use airspace.

In addition, for the analysis of EO 13045, areas underlying the 65 dB DNL and above airfield noise contours or noise levels below the primary airspace units were identified and the percentage of children ages 17 and younger was calculated. Locations of schools and child care centers were also analyzed as noise-sensitive receptors.

3.11 Infrastructure (Base-Specific Sections 3.13)

Infrastructure assets at each installation include electrical and natural gas, potable water, wastewater, solid waste, and storm drainage system.

3.11.1 Regulatory Setting

There is no applicable regulatory setting for infrastructure resources.

3.11.2 Methodology

Potential impacts on infrastructure elements are assessed in terms of effects of implementing construction projects and personnel changes on existing service levels. Impacts on utilities are assessed with respect to the potential for disruption or improvement of current utility systems, deterioration, or improvement of existing levels of service, and changes in existing levels of

utility safety. Impacts may arise from physical changes to utility corridors, construction activity, and change in demand for services from changes in personnel.

3.12 Transportation (Base-Specific Sections 3.14)

Transportation resources include the infrastructure required for the movement of people, materials, and goods.

3.12.1 Regulatory Setting

There is no applicable regulatory setting for transportation resources.

3.12.2 Methodology

To assess potential environmental consequences associated with transportation resources, increased utilization of the existing roadway system due to the potential increase of personnel is analyzed, as well as potential effects of construction activities. Anticipated impacts on the operational characteristics of these roadways, using levels of service and other metrics are identified.

3.13 Hazardous Materials and Waste (Base-Specific Sections 3.15)

The terms "hazardous materials" and "hazardous waste" refer to substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA). In general, hazardous materials includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristic, may present substantial danger to public health or the environment when released into the environment. Hazardous wastes that are regulated under RCRA are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that either exhibit one or more of the hazardous characteristics of ignitability, corrosivity, toxicity, or reactivity, or are listed as a hazardous waste under 40 CFR Part 261, "Identification and Listing of Hazardous Waste." The Environmental Restoration Program and Installation Restoration Program are DoD programs to identify, characterize, and remediate contamination from past activities at DoD installations.

3.13.1 Regulatory Setting

Hazardous substances are identified and regulated under CERCLA, the Occupational Safety and Health Administration, RCRA, the Toxic Substances Control Act, and the Emergency Planning and Community Right-to-Know Act. Hazardous materials have been defined in AFI 32-7086, *Hazardous Materials Management* (Air Force 2004b), to include any substance with special characteristics that could harm people, plants, or animals. Waste may be classified as hazardous because of its toxicity, reactivity, ignitability, or corrosivity.

3.13.2 Methodology

The qualitative and quantitative assessment of impacts from hazardous materials and waste management focuses on how and to what degree each alternative location may affect hazardous materials usage and management, hazardous waste generation and management, and hazardous waste disposal. An impact was considered significant if (1) the generation of

hazardous waste types or quantities could not be accommodated by the current management system, or (2) there was an increased likelihood of an uncontrolled release of hazardous materials that could contaminate the soil, surface water, groundwater, or air.

Chapter 4

How to Use This Document

Our goal is to give you a reader-friendly document that provides an in-depth, accurate analysis of the Proposed Action, the alternative beddown locations, and the potential environmental consequences for each base. The organization of this Final Environmental Impact Statement (Final EIS) is shown below.

Overall Proposal

Table of Contents, List of Figures, List of Tables, and Acronyms and Abbreviations

Preface: Detailed Guide for Reading the EIS → The Preface provides a detailed guide for reading the EIS.

Chapter 1: Purpose and Need for F-35A Training Basing → Chapter 1 explains the decision made by Congress to provide the U.S. Air Force with a next-generation fighter. Also described are the features of the F-35A, how the F-35A will be based, and how aircrews will train for their operational assignments.

Chapter 2:
- Overview of Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of Proposed Action and Alternatives

→ Chapter 2 provides an overview of the Proposed Action and alternatives, which is to beddown the F-35A at Boise AGS, Holloman AFB, Luke AFB, and/or Tucson AGS.

Chapter 3: Resource Definition and Methodology for Analysis → Chapter 3 defines the environmental resources that could potentially be affected by the Proposed Action and explains the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base Specific Information

Boise AGS	Holloman AFB	Luke AFB	Tucson AGS
Section BO 1.0 Alternative Overview	**Section HO 1.0** Alternative Overview	**Section LU 1.0** Alternative Overview	**Section TU 1.0** Alternative Overview
Section BO 2.0 Base-Specific Project Details	**Section HO 2.0** Base-Specific Project Details	**Section LU 2.0** Base-Specific Project Details	**Section TU 2.0** Base-Specific Project Details
Section BO 3.0 Affected Environment and Environmental Consequences	**Section HO 3.0** Affected Environment and Environmental Consequences	**Section LU 3.0** Affected Environment and Environmental Consequences	**Section TU 3.0** Affected Environment and Environmental Consequences
Section BO 4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section HO 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section LU 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	**Section TU 4.0** Cumulative Effects, Irreversible and Irretrievable Commitment of Resources

Overall Proposal

References Volume 1	**List of Preparers** Volume 1	**Index** Volume 1	**List of Repositories** Volume 1	**Glossary** Volume 1	**Appendices A, B, and C** Volume 2

DEIS Comments

Appendix D, D.1, D.2, and D.3 Receipt and Locating Comments Volume 2	**Appendix D, D.4 and D.5** Alphabetical Directory Volume 2	**Appendix D, D.6, D.7, D.8, and D.9** Copies of Letters and Transcripts Volume 2	**Appendix D, D.10** Response to Comments Volume 2

Chapter 4. Base-Specific Sections

The information in Chapter 4 forms the basis for the environmental comparative analysis presented in Table 2–12 at the end of Chapter 2 for the alternatives. The goal in producing this Environmental Impact Statement has been to prepare as concise a document as possible that addresses the base-specific concerns of individuals and agencies, while meeting the comparative needs of the U.S. Air Force decisionmakers.

This presentation of base-specific information in Chapter 4 and comparative analysis in Chapter 2 demonstrates responsiveness to individuals who participated in scoping and provides comparative materials needed by the U.S. Air Force decisionmakers.

Chapter 4 addresses those interests and concerns in four base-specific sections. The description in Section 2.0 for each base includes the number of aircraft involved, buildings needed, amount of area disturbed, personnel changes, flight operations, and airspace use. Section 3.0 in each base-specific section presents the affected environment baseline conditions, followed by a description of the potential environmental consequences evaluated by applying the regulations and methodology provided in Chapter 3 for each environmental resource. Section 4.0 for each base presents cumulative and irreversible aspects of a beddown decision at each base.

As indicated in Chapter 2, Section 2.4 and Section 2.8, of this EIS, the development of F-35A aircraft is a dynamic process with uncertainties, and at this early stage of development limited data are available on its performance characteristics. The limited data and knowledge available were used to assess the impacts of F-35A flying operations and identify possible mitigations. As the program evolves, the Air Force will gain greater understanding of the aircraft's performance characteristics and will be better able to define and assess impacts from its operation. The Air Force will use an adaptive management process to monitor and evaluate the F-35A Training Program to identify ways to address program-related impacts and manage noise issues. Although every effort will be made by the proponent to fund identified mitigations, application of some proposed mitigation measures may be subject to Congressional appropriations.

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Alternative

Boise AGS

You are in the Boise AGS section.

This page is intended to help you find specific information about Boise AGS and to clarify this section's relation to the rest of the EIS.

Overall Proposal

Table of Contents, List of Figures, List of Tables, and Acronyms and Abbreviations

Preface: Detailed Guide for Reading the EIS → Go back to the Preface for a detailed guide for reading the EIS.

Chapter 1: Purpose and Need for F-35A Training Basing → Go back to Chapter 1 for an explanation of the decision made by Congress to provide the U.S. Air Force with a next-generation fighter. Also described are the features of the F-35A, how the F-35A will be based, and how aircrews will train for their operational assignments.

Chapter 2:
- Overview of Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of Proposed Action and Alternatives

→ Go back to Chapter 2 for an overview of the Proposed Action and alternatives, which is to beddown the F-35A at Boise AGS, Holloman AFB, Luke AFB, and/or Tucson AGS.

Chapter 3: Resource Definition and Methodology for Analysis → Go back to Chapter 3 for a definition of the environmental resources that could potentially be affected by the Proposed Action and an explanation of the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base-Specific Information

BO-Boise AGS Alternative

HO-Holloman AFB Alternative — See Holloman AFB Section

LU-Luke AFB Alternative — See Luke AFB Section

TU-Tucson AGS Alternative — See Tucson AGS Section

Section BO 1.0
Introduction

Section BO 2.0
Detailed Description of Action

Section BO 3.0
Affected Environment and Environmental Consequences

Aircraft Operations
- BO 3.1 Airspace Management and Use
- BO 3.2 Noise
- BO 3.3 Air Quality
- BO 3.4 Safety

Natural Resources
- BO 3.5 Soils and Water
- BO 3.6 Vegetation and Wildlife
- BO 3.7 Wetlands and Aquatic Communities
- BO 3.8 Threatened, Endangered, and Special Status Species

Cultural and Traditional Resources
- BO 3.9 Cultural Resources

Human Resources
- BO 3.10 Land Use and Recreation
- BO 3.11 Socioeconomics
- BO 3.12 Environmental Justice and Protection of Children

Community and Infrastructure
- BO 3.13 Infrastructure
- BO 3.14 Transportation
- BO 3.15 Hazardous Materials and Waste

Section BO 4.0
Cumulative Effects and Irreversible and Irretrievable Commitment of Resources

This section of the EIS presents site-specific and resource-specific details on the existing environmental conditions of Boise AGS. It also describes the potential environmental consequences of the proposed beddown of the F-35As at the base.

A summary of public and agency comments received during scoping is included in Section BO 2.2.3.

Comments received during the public review period of the Draft EIS, as well as Air Force responses, are included in Appendix D.

Overall Proposal

References	List of Preparers	Index	List of Repositories	Glossary	Appendices A, B, and C
Volume 1	Volume 1	Volume 1	Volume 1	Volume 1	Volume 2

DEIS Comments

Appendix D, D.1, D.2, and D.3	Appendix D, D.4 and D.5	Appendix D, D.6, D.7, D.8, and D.9	Appendix D, D.10
Receipt and Locating Comments	Alphabetical Directory	Copies of Letters and Transcripts	Response to Comments
Volume 2	Volume 2	Volume 2	Volume 2

BO 1.0 Boise AGS Overview

This section of Chapter 4 presents the operational and environmental factors specific to Boise Air Terminal Airport Air Guard Station (Boise AGS). Section BO 2.0 explains three scenarios are being considered for Boise AGS: a beddown of 24 Primary Aircraft Authorized (PAA) (Scenario B1), 48 PAA (Scenario B2), or 72 PAA (Scenario B3), and describes the specific actions at Boise AGS that would be required for each beddown scenario.

The environmental resources at Boise AGS, as well as under its airspace, would be affected by the basing of an F-35A Pilot Training Center (PTC). These resources and the potential consequences are discussed in Section BO 3.0. Section BO 4.0 describes the cumulative actions and consequences and the irreversible and irretrievable commitment of resources that would be associated with a basing decision at Boise AGS. Figure BO 1.0–1 shows the location of Boise AGS and surrounding communities.

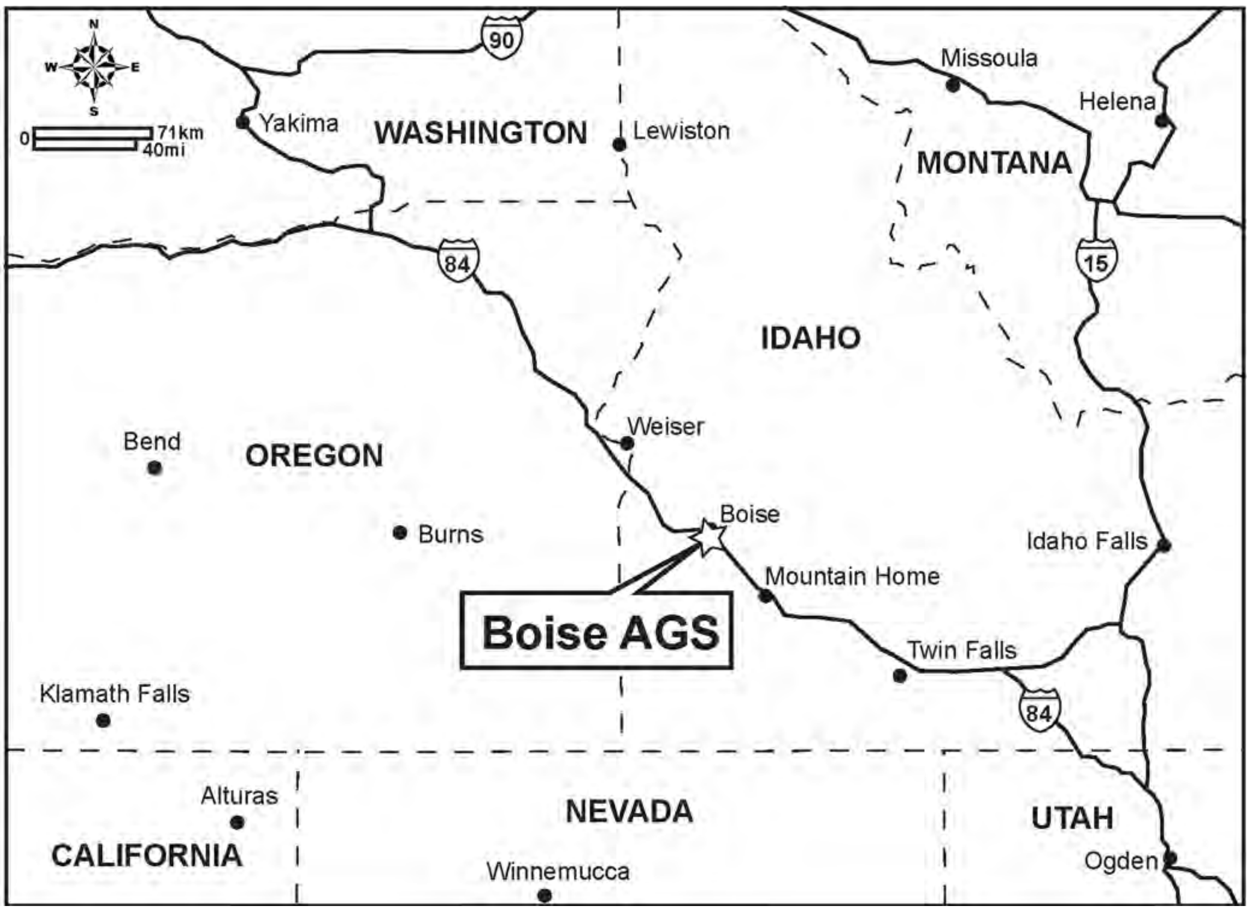


Figure BO 1.0–1. Vicinity of Boise AGS, Idaho

BO 2.0 Boise AGS Alternative (Scenarios B1, B2, and B3)

This section details the actions that would occur at Boise AGS, Idaho, and in the associated training airspace if Boise AGS were selected for the basing of an F-35A PTC.

Boise AGS was evaluated by the U.S. Air Force (Air Force) for the potential to beddown up to 144 F-35A aircraft. However, the Air Force determined Boise AGS's infrastructure and base resources would accommodate between 24 F-35A PAA and 72 F-35A PAA within the constraints set by the Air Force's alternative narrowing process described in Chapter 2, Section 2.2.2. This Environmental Impact Statement (EIS) includes three F-35A beddown scenarios: Scenario B1 (24 PAA), Scenario B2 (48 PAA), and Scenario B3 (72 PAA), as shown in Table BO 2.0–1. For planning purposes in this EIS, the A-10 mission currently located at Boise AGS is assumed to relocate to another installation if more than 24 F-35A aircraft were bedded down. As described in Chapter 2, Section 2.5, the No Action Alternative for Boise AGS constitutes the baseline conditions.

Table BO 2.0–1. Boise AGS F-35A Aircraft Scenarios

Aircraft Scenario	*A-10 PAA*	*F-35A PAA*	*Total PAA at Boise AGS*
Baseline Conditions	18	0	18
Scenario B1 (24 Aircraft)	18	24	42
Scenario B2 (48 Aircraft)	0	48	48
Scenario B3 (72 Aircraft)	0	72	72

BO 2.1 Boise AGS: Base

Three elements of this alternative have the potential to affect Boise AGS and its immediate vicinity. These three elements are (1) airfield operations, (2) construction/renovation of facilities, and (3) personnel changes. Each is described in detail below. This EIS evaluates the environmental consequences of the beddown of F-35A aircraft under each aircraft scenario.

BO 2.1.1 Airfield Operations

Table BO 2.1–1 provides the number of annual airfield operations anticipated with the basing of the F-35A training mission at Boise AGS by each aircraft scenario. Boise Air Terminal Airport is expected to accommodate a steadily increasing number of civilian aircraft operations unrelated to the F-35A beddown. By 2017, annual civilian airfield operations are expected to have increased by approximately 31,300 (27 percent) relative to Fiscal Year (FY) 2009 (see Table BO 2.1–1). Under Scenario B1, the F-35A airfield operations would be in addition to the existing A-10 mission at Boise AGS, as well as increased numbers of civilian operations. Approximately 30 percent of that increase would be F-35A airfield operations (12,998 airfield operations). Under Scenario B1, approximately 7 percent of total airfield operations at Boise Air Terminal Airport would be conducted by F-35A aircraft. Under Scenario B2, the A-10 mission would no longer be at Boise AGS, bringing the annual number of A-10 airfield operations to zero. The 26,000 annual

> ***Airfield operations*** are categorized as takeoffs, landings, closed patterns (including activities referred to as "touch-and-go operations," "go-arounds," or "low approaches"), or inter-facility transfers.

F-35A airfield operations under Scenario B2 and 38,988 under Scenario B3 would make up 14 percent and 20 percent of the total operations at the airfield, respectively.

Table BO 2.1–1. Boise AGS Baseline and Projected Annual Airfield Operations

	Baseline Annual Airfield Operations[1]	*Projected Annual F-35A Airfield Operations*		
		Scenario B1 (24 Aircraft)	**Scenario B2 (48 Aircraft)**	**Scenario B3 (72 Aircraft)**
F-35A	0	12,998	26,000	38,998
A-10	5,000	5,000	0	0
Other Military[2]	7,122	7,122	7,122	7,122
Boise AGS Total	12,122	25,120	33,122	46,120
Boise Air Terminal Airport	117,350	148,655	148,655	148,655
Total	**129,472**	**173,775**	**182,777**	**194,775**

[1] Projected 2008 operations as described in the Boise Airport 14 CFR Part 150 Study Update (Boise 2006).
[2] Other military includes the Army National Guard and other tenant units stationed at Boise AGS as well as transient users.

The percentage of F-35A departures expected to use afterburner has been adjusted from the generalized percentage shown in Chapter 2, Table 2–6, based on local flying conditions such as airfield elevation and runway length. At Boise AGS, 5 training events in the F-35A training syllabus have the potential for the use of afterburners during takeoff. As the training syllabus consists of 58 total training events, approximately 9 percent of all F-35A departures would use afterburner to fulfill the training syllabus.

Of the 58 training events in the F-35A training syllabus, 10 have the potential for after-dark flights, constituting approximately 17 percent of the sorties under each aircraft scenario. Using historical flight operations at Boise AGS, it was estimated that approximately 52 percent of the after-dark sorties (approximately 9 percent of total F-35A sorties) would occur at least partially during "environmental night" (10:00 p.m. to 7:00 a.m.) under Scenario B1. Sorties conducted during environmental night are assigned an additional noise penalty of 10 decibels (dB) in calculation of certain noise metrics to account for low ambient noise levels and the increased potential for sleep disturbance. Under Scenario B2, approximately 54 percent of night sorties would be conducted at least partially after 10:00 p.m. (9 percent of F-35A sorties), and under Scenario B3, approximately 55 percent of night sorties (10 percent of total F-35A sorties) would be conducted at least partially during this late-night time period.

The F-35A would employ similar departure, closed patterns, and landing procedures as currently used by Boise AGS aircraft. F-35A operations would adhere to existing restrictions, avoidance procedures, and agreements with Boise Air Terminal Airport.

BO 2.1.2 Construction

Additional facilities and infrastructure would be required at Boise AGS to support F-35A training operations. Table BO 2.1–2 lists the F-35A-related construction, demolition, and renovation projects required for each aircraft scenario. Construction, demolition, and renovation of facilities would take place within the 576 acres of previously disturbed area of the military installation included in the current lease agreement between the City of Boise and the U.S. Government or within the airfield environment.

Table BO 2.1–2. F-35A Construction at Boise AGS Under Each Aircraft Scenario

Project	*No. of Aircraft*[1]	*Renovate*	*New/ Addition*	*Total Disturbed Area (square feet)*[2]
Runway Improvements [Hold Short Lines]	24	X		336,600
Runway Approach End (1,000 feet of cement)	24		X	336,600
Taxiway – South Ramp (75 feet wide)	24	X		663,300
Parking Apron Improvements	24	X		57,200
Aircraft Arrest System (BAK012ER)	24		X	1 system
Squadron Operations	24	X		26,959
Simulators	24	X		33,902
Operational Training Facility (FTD classrooms)	24		X	13,662
Maintenance Hangars	24		X	17,600
Hangar Upgrades	24	X		28,798
Battery Maintenance	24		X	880
Ejection Seat Maintenance	24		X	3,410
Flightline Maintenance Facility	24		X	2,970
Engine Maintenance	24		X	880
Corrosion Control Hangar	24		X	13,200
Gun System Maintenance Shop	24		X	3,300
Support AGE Maintenance Facility	24	X		12,100
Bulk Fuel Storage (210,000-gallon tank)	24		X	10,000
ComSec Space	24		X	1,540
Electrical infrastructure	24		X	1 each
AGE Storage Area – outdoor/covered	24		X	9,900
Apron re-stripe	24	X		1 each
Squadron Operations	48		X	24,200
Squadron Operations/Aircraft Maintenance Unit	72		X	46,200
Academic Training Center for 3 Squadrons	24, 48, 72		X	92,400
Interim moves and relocations	24, 48, 72	X		80,850
Total for Scenario B1 (24 Aircraft)				**1,746,051**
Total for Scenario B2 (48 Aircraft)				**1,770,251**
Total for Scenario B3 (72 Aircraft)				**1,816,451**

[1] Construction for aircraft scenarios is additive, i.e., construction required for 72 aircraft includes all proposed construction under 24, 48, and 72 aircraft.
[2] Total disturbed area is estimated to be 10 percent larger than the footprint of the finished facility as a best engineering estimate to account for disturbance by construction activities, including laydown areas and utility connections.
Key: AGE=aerospace ground equipment; FTD=Field Training Detachment.

The total disturbed area presented in Table BO 2.1–2 comprises the total area covered by the construction footprints of the proposed facilities, plus an estimate of the surrounding lands where construction-related clearing and grading would occur. Construction activities are expected to begin in FY2012 and be complete by FY2014, when the first F-35A is expected to be bedded down. For the F-35A, holding spots at the end of the runways would need to be replaced with concrete.

Boise AGS's C-130 mission was relocated as part of the 2005 Defense Base Realignment and Closure recommendations. The departure of the C-130 mission provides facilities and infrastructure that can be modified for up to 24 F-35A aircraft. Renovations would be required for the existing facilities to meet the security requirements and space requirements for the F-35A. The beddown of 48 or 72 aircraft would require additional construction for squadron operations, maintenance, and hangars. The construction of a new F-35A campus would also require the relocation of the Army National Guard from the south ramp of Boise AGS to the west ramp. The F-35A training aircraft would be located on the east and south ramps of the flightline (see Figure BO 2.1–1).

BO 2.1.3 Personnel Changes

Beddown of the F-35A training mission would also require basing appropriately skilled personnel sufficient to operate and maintain the wing and provide necessary support services. Each aircraft scenario has a different manpower requirement. Under Scenario B1, F-35A personnel would be based at Boise AGS in addition to the personnel required by baseline conditions, including support of the A-10 mission (see Table BO 2.1–3). Under Scenarios B2 and B3, it was assumed that the A-10 mission would relocate concurrently with the F-35A mission beddown.

Table BO 2.1–3. Boise AGS F-35A Training Mission Personnel and Dependent Changes

F-35A Scenario (No. of Aircraft)	*A-10 Mission Personnel[1]*	*Other Base Personnel*	*F-35A Personnel*	*F-35A Contractors*	*F-35A Students[2]*	*Total Base Personnel*	*Net Change in Personnel*	*Depen-dents[3]*	*Total Base Population*	*Net Change*
Baseline Conditions	737	813	–	–	–	1,550	N/A	3,410	4,960	N/A
Scenario B1 (24)	737	813	598	50	30	2,228	678	4,836	7,065	2,105
Scenario B2 (48)	–	813	1,846	50	60	2,769	1,219	5,959	8,728	3,768
Scenario B3 (72)	–	813	2,356	50	90	3,309	1,759	7,082	10,391	5,431

1 Air National Guard A-10 mission personnel only.
2 The Air Force assumes the F-35A students would be unaccompanied by dependents.
3 The Air Force assumes 2.2 dependents per military member.
Note: No changes proposed to personnel associated with the Army National Guard or other tenant organizations.
Key: BOS=Base operating support.

BO 2.2 Boise AGS: Airspace and Ranges

As a replacement and supplement to the A-10 aircraft at Boise AGS and the F-15 aircraft at Mountain Home Air Force Base (Mountain Home AFB), the F-35A would conduct similar missions and training programs similar to both aircraft (see Chapter 2). This would include air-to-air and air-to-ground training. The Air Force expects that the F-35A would operate in the airspace associated with Boise AGS, nearby Mountain Home AFB, and the Mountain Home Range Complex in a manner similar to the Boise AGS A-10 aircraft and the Mountain Home AFB F-15 aircraft, which currently use that airspace. All F-35A flight training activities would take place in existing airspace; therefore, no airspace modifications would be required.

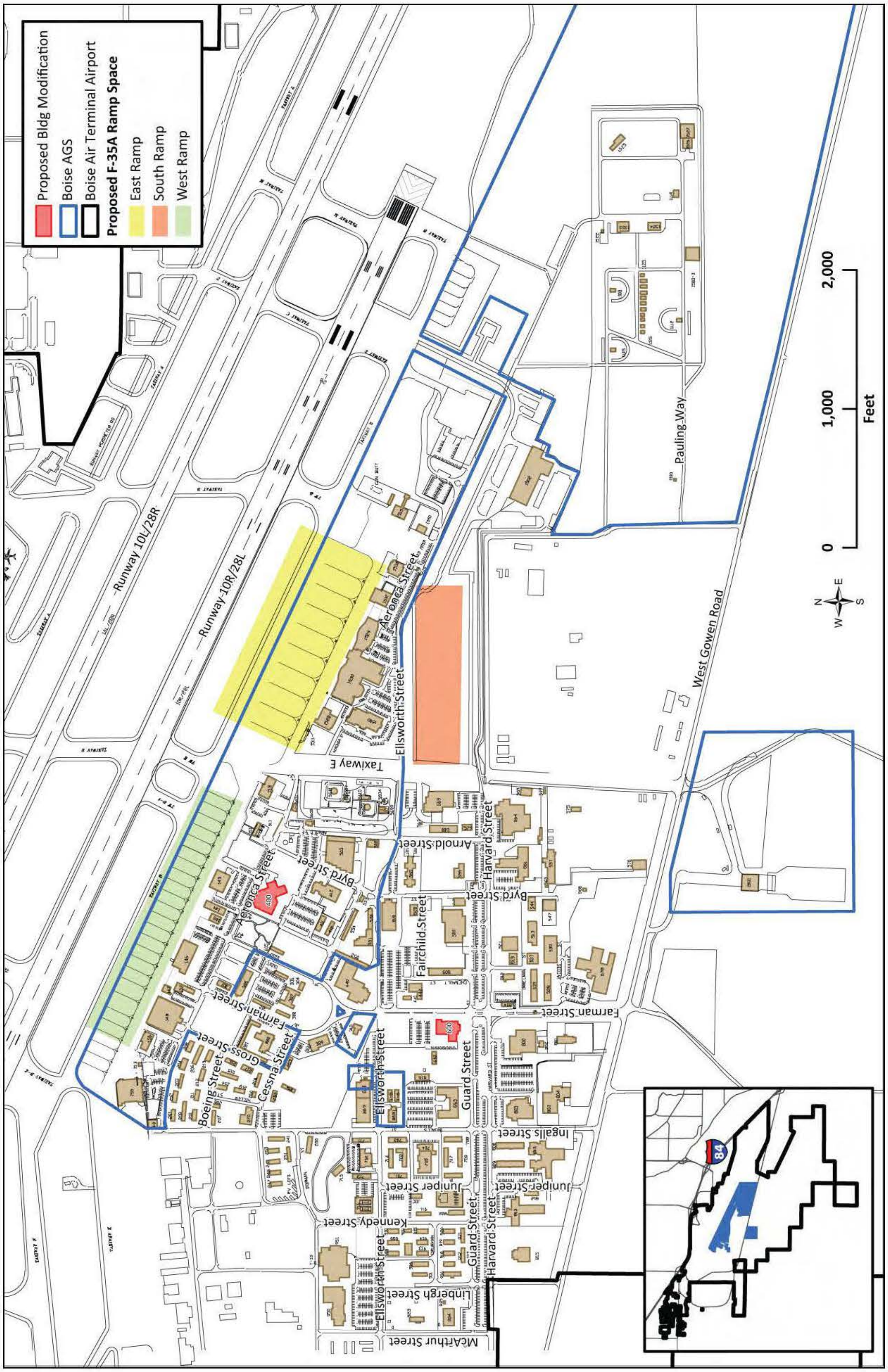


Figure BO 2.1–1. F-35A Ramp Space, Boise AGS

BO 2.2.1 Airspace and Auxiliary Airfield Use

Airspace

Figure BO 2.2–1 shows the primary Special Use Airspace (SUA) and Airspace for Special Use the F-35A would use for flight training, and Table BO 2.2–1 lists annual sortie-operations counts under baseline conditions and Scenarios B1, B2, and B3. F-35A aircraft would use other SUA units on an occasional basis, typically when primary airspace units are not available due to inclement weather or scheduling conflicts. Each of the primary use Military Operations Areas (MOAs) have overlying Air Traffic Control Assigned Airspace (ATCAAs) to provide the higher altitudes needed for flight maneuvers above the MOA ceilings. The Jarbidge North/South, Owyhee North/South, and Paradise North and South MOAs/ATCAAs and two Restricted Areas are scheduled and managed by Mountain Home AFB and are referred to collectively as the "Mountain Home Range Complex" (MHRC) (see Section 3.1.2.1, Table BO 3.1–1). In the fall of 2011, the MHRC was reconfigured, which included additional segmentation of the airspace units, a lateral expansion of the existing airspace units, and lowering of the floors of what is now Paradise North/South MOAs. The baseline and projected sortie-operations in Table BO 2.2–1 reflect operations conducted in the reconfigured airspace.

> A ***sortie-operation*** is the use of one airspace unit by one aircraft.

The Saddle A and B MOAs/ATCAAs are controlled by Boise AGS. Cooperative scheduling of this airspace by both Mountain Home AFB and Boise AGS, as well as coordination with the Salt Lake City Air Route Traffic Control Center (ARTCC), has ensured the needs of all airspace users are accommodated. In addition to the A-10s of the 124th Fighter Wing (124 FW), daily users of these airspace units include the F-15s located at Mountain Home AFB, as well as the Army National Guard HH-60 and H-64 helicopters located at Boise AGS. Transient users include B-52s, B-1s, C-130s, F/A-18s, KC-135s, KC-10s, EA-6Bs, and E/A-18G Growlers. Flight restrictions are in place over the Duck Valley Reservation. Overflights are not authorized within a 5-nautical-mile (NM) radius around the town of Owyhee and are restricted to 15,000 feet above ground level (AGL) and above over the remaining portions of the reservation. Supersonic operations and the use of chaff or flares are not authorized over any part of the reservation.

In addition to MOAs, ATCAAs, and Restricted Areas, low-level Military Training Routes (MTRs) would be used in F-35A training events. Table BO 2.2–2 lists baseline and projected sortie-operations on the primary MTRs to be used by the F-35A. Occasional use MTRs would include VR-1300, VR-1301, IR-303, and IR-304 and would typically be used when primary MTRs are not available.

The F-35A would operate at higher altitudes more often than legacy aircraft due to its advanced sensors and targeting capabilities. Approximately 85 percent of the training events in the F-35A training syllabus would be conducted at altitudes higher than 10,000 feet AGL (see Table BO 2.2–3).

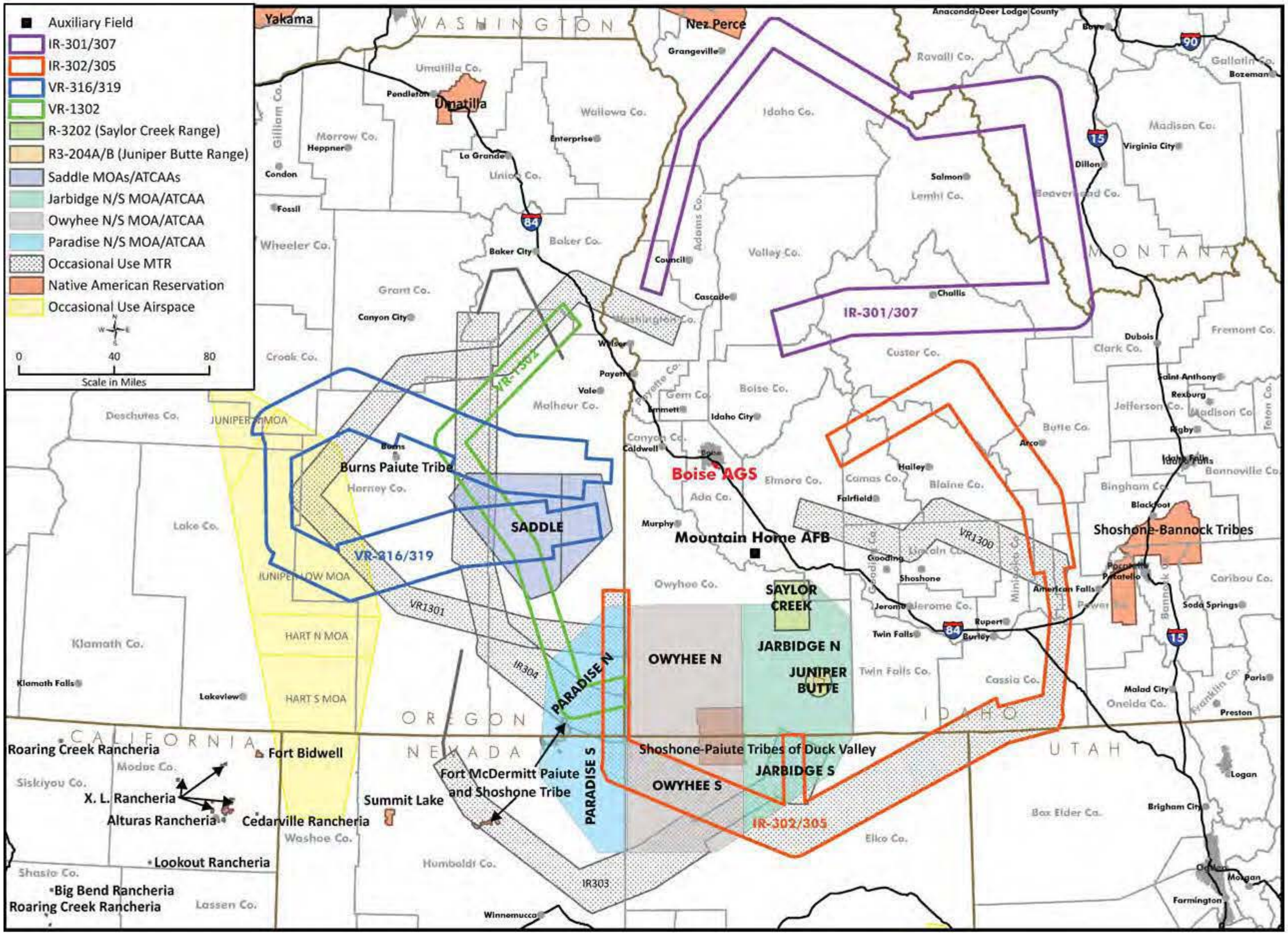


Figure BO 2.2–1. Airspace and Ranges for the F-35A Beddown at Boise AGS, Idaho

Table BO 2.2–1. Projected F-35A Airspace Use at Boise AGS

F-35A Primary Use Airspace	*Supersonic Authorized?*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	*Projected F-35A Annual Sortie-Operations* Scenario B1 (24 Aircraft)	Scenario B2 (48 Aircraft)	Scenario B3 (72 Aircraft)
MOAs/ATCAAs						
Jarbidge North MOA/ATCAA	Yes, at or above 10,000 feet AGL	F-35A	0	2,364	4,728	7,091
		A-10	2,450	2,450	0	0
		F-15	7,898	7,898	7,898	7,898
		Transients	452	452	452	452
		Total	**10,800**	**13,164**	**13,078**	**15,441**
Jarbidge South MOA/ATCAA Owyhee South MOA/ATCAA Paradise North/South MOA/ATCAA	Yes, at or above 30,000 feet MSL	F-35A	0	169	338	507
		A-10	41	41	0	0
		F-15	2,204	2,204	2,204	2,204
		Transients	155	155	155	155
		Total	**2,400**	**2,569**	**2,697**	**2,866**
Owyhee North MOA/ATCAA	Yes, at or above 10,000 feet AGL	F-35A	0	1,942	3,883	5,825
		A-10	1,680	1,680	0	0
		F-15	7,770	7,770	7,770	7,770
		Transients	250	250	250	250
		Total	**9,700**	**11,642**	**11,903**	**13,845**
Saddle A/B MOAs/ATCAAs	No	F-35A	0	1,688	3,377	5,065
		A-10	658	658	0	0
		F-15	2,121	2,121	2,121	2,121
		Transients	121	121	121	121
		Total	**2,900**	**4,588**	**5,619**	**7,307**
Restricted Areas						
R-3202 (Saylor Creek Range)	Yes, at or above 10,000 feet AGL	F-35A	0	2,364	4,728	7,091
		A-10	2,450	2,450	0	0
		F-15	7,898	7,898	7,898	7,898
		Other	452	452	452	452
		Total	**10,800**	**13,164**	**13,078**	**15,441**
R-3204A/B (Juniper Butte Range)	Yes, at or above 10,000 feet AGL	F-35A	0	2,364	4,728	7,091
		A-10	2,450	2,450	0	0
		F-15	7,898	7,898	7,898	7,898
		Other	452	452	452	452
		Total	**10,800**	**13,164**	**13,078**	**15,441**

Note: Jarbidge South, Owyhee South, and Paradise North/South MOAs and ATCAAs would be scheduled and used as a single airspace complex; therefore, the number of sortie-operations for these airspace units is generally the same. Jarbidge North MOA, R-3202, and R-3204 are used in conjunction with one another; therefore, their usage is generally the same.

Table BO 2.2–2. Projected F-35A MTR Use at Boise AGS

MTR	*Min/Max Altitudes*	*Min/Max Width*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	*Projected Annual F-35A Sortie-Operations* Scenario B1 (24 Aircraft)	Scenario B2 (48 Aircraft)	Scenario B3 (72 Aircraft)
IR-301/307[1]	100 feet AGL–13,000 feet MSL	4–8 NM either side of centerline	F-35A	0	104	207	311
			F-15	342	342	342	342
			A-10	4	4	0	0
			Other	16	16	16	16
			Total	**362**	**466**	**565**	**669**
IR-302/305[1]	100 feet AGL–13,000 feet MSL	4–8 NM either side of centerline	F-35A	0	127	253	380
			F-15	324	324	324	324
			A-10	8	8	0	0
			Other	13	13	13	13
			Total	**345**	**472**	**590**	**717**
VR-316/319[1]	100 feet AGL–10,000 feet MSL	4–10 NM either side of centerline	F-35A	0	20	39	59
			F-15	2	2	2	2
			A-10	4	4	0	0
			Other	12	12	12	12
			Total	**18**	**38**	**53**	**73**
VR-1302[1]	100–1,500 feet AGL	5 NM either side of centerline	F-35A	0	3	7	10
			F-15	0	0	0	0
			A-10	4	4	0	0
			Other	0	0	0	0
			Total	**4**	**7**	**7**	**10**

[1] IR-301 and IR-307 are reverse direction routes of each other and differ from one another only in the direction of flight. The same is true for IR-302 and -305 and VR-316 and -319.

Note: F-35A training flights are limited to a minimum altitude of 500 feet above ground level.

Table BO 2.2–3. Representative A-10, F-15, and F-35A Altitude Use

Altitude (feet)	*Percentage of Flight Hours* A-10	F-15	F-35A
> 30,000 MSL	0	3	6
18,000–30,000 MSL	0	35	34
10,000 AGL–18,000 MSL	4	20	45
5,000–10,000 AGL	33	12	8
2,000–5,000 AGL	26	12	4
500–2,000 AGL	30	18	3
100–500 AGL	7	0	0

Several training events in the F-35A syllabus could potentially use supersonic speeds. Supersonic operations would be conducted in authorized airspace. In the MHRC airspace discussed in Table BO 2.2–1, supersonic operations are authorized in the Jarbidge South, Owyhee South, and Paradise North and South ATCAAs above 30,000 feet mean sea level (MSL) and in the Owyhee North and Jarbidge North MOAs above 10,000 feet AGL, except in the airspace overlying the Duck Valley Reservation. Supersonic operations are not authorized in the Saddle A or B MOAs/ATCAAs.

Auxiliary Airfield

Mountain Home AFB. Mountain Home AFB is identified as the auxiliary airfield for Boise AGS F-35A training aircraft. Table BO 2.2–4 shows the number of airfield operations at Mountain Home AFB under each aircraft scenario. The airfield operations from the Boise AGS F-35A training mission are compared with the baseline conditions at Mountain Home AFB. Mountain Home AFB is an alternative for the beddown of the F-35A operational mission being evaluated in a separate EIS. The operational F-35A mission alternative at Mountain Home AFB is evaluated in BO 4.0, Cumulative Impacts.

Table BO 2.2–4. Baseline and Projected Annual Auxiliary Airfield Operations at Mountain Home AFB

Aircraft Type	*Baseline Annual Airfield Operations*	*Projected F-35A Annual Airfield Operations*		
		Scenario B1 (24 Aircraft)	**Scenario B2 (48 Aircraft)**	**Scenario B3 (72 Aircraft)**
F-35A	0	7,091	14,182	21,272
F-15	26,579	26,579	26,579	26,579
Transients	3,483	3,483	3,408	3,408
Total	**30,062**	**37,153**	**44,169**	**51,259**

BO 2.2.2 Ranges, Ordnance, and Defensive Countermeasures

Saylor Creek (R-3202) and Juniper Butte Ranges (R-3204) are part of the MHRC and contain varied target sets for supporting laser and air-to-ground weapons training. The restricted airspace underlies the Jarbidge North MOA. The MHRC also has a number of threat emitters located under the Jarbidge North MOA that can be used to simulate combat. Thirteen of these threat emitters can be relocated to a total of 34 positions within the MHRC to vary the threat scenarios. No live weapons are permitted in the MHRC. The nearest range where live weapons are permitted is the Utah Test and Training Range (UTTR) near Hill AFB, Utah.

The F-35A is designed primarily as an air-to-ground weapons system. With the advances in technology, specifically targeting systems and guided munitions, the F-35A would only utilize guided ordnance, as listed in Chapter 2, Table 2–10. This table lists the type and number of munitions to be used by the F-35A aircraft while fulfilling the syllabus requirements for the training mission. The guided munitions allow the F-35A to deploy munitions from a higher altitude and from longer distances than the unguided munitions often used by the A-10 or F-15. In addition to guided munitions, the F-35A is equipped with a 25-millimeter cannon. Table BO 2.2–5 lists the same munitions prorated by the number of F-35A aircraft under each scenario at Boise AGS. Because no live weapons are authorized in the MHRC, live weapon drops would be conducted at another range where live drops are authorized, such as the UTTR. Boise AGS F-35A aircraft would transit to Mountain Home AFB as they currently do, and load live and heavy inert ordnance for use on UTTR. No live ordnance would be loaded or carried by F-35A aircraft from Boise AGS. Annually live weapon drops would be infrequent, up to 108 per year under Scenario B3 as only one training event per syllabus requires live weapons. Compared to Mountain Home AFB's baseline airfield operations, these events would comprise approximately 0.3 percent of total airfield operations.

Table BO 2.2–5. Projected F-35A Annual Munitions Use

Munitions Type	*Projected Annual F-35A Usage* Scenario B1 (24 Aircraft)	Scenario B2 (48 Aircraft)	Scenario B3 (72 Aircraft)	*Range Permitted*
GBU-12 (live)	36	72	108	UTTR
GBU-12 (inert)	78	156	234	Saylor Creek
GBU-31 (inert)	20	40	60	Saylor Creek
GBU-32 (inert)	26	52	78	Saylor Creek
25-millimeter Target Practice (TP)	52,000	104,000	156,000	Saylor Creek
MJU-61/B Training Flares	26,400	52,800	79,200	Authorized Airspace

Key: GBU=Guided Bomb Unit; MJU=Mobile Jettison Unit.

At the MHRC, inert 25-pound Bomb Dummy Unit (BDU)-33 or equivalent munitions are the only type authorized for the Juniper Butte Range. The Saylor Creek Range allows the use of inert BDU-33 as well as heavier inert weapons such as the BDU-50 (500 pounds), Guided Bomb Unit (GBU)-12 (500 pounds), BDU-56 (2,000 pounds), and the GBU-10 (2,000 pounds). Saylor Creek Range also allows the use of 2.75-inch rockets with the M156 White Phosphorous, M257 and M258 illumination munitions, and other training ordnance. The munitions proposed for the F-35A are the inert 500-pound GBU-12 and the inert 1,000-pound GBU-31. These proposed munitions would be dropped in Saylor Creek Range, while the live GBU-12 munitions would be dropped at another authorized range such as the UTTR. Strafing runs using the 25-millimeter cannon would also be restricted to Saylor Creek Range or another authorized range.

Flares are authorized within Saylor Creek Range and Juniper Butte Range. Flares are also authorized in Jarbidge North/South MOAs, Owyhee North/South MOAs, and Paradise North/South MOAs, with a release altitude of no lower than 3,000 feet AGL. Flares are not authorized over the Duck Valley Reservation or in the Saddle MOAs/ATCAAs. Mountain Home AFB, which manages the airspace, would also have the discretion to restrict flare use in times of high or extreme fire danger. The F-35A would train with MJU-61/B training flares, which are described in detail in Chapter 2, Section 2.4.5. The MJU-61/B training flare is the same size as the legacy M-206 flare and has similar components, with the addition of an igniter device similar to the MJU-7/B flare. M-206 and MJU-7/B flares are currently used by the F-15Es and the Royal Singapore Air Force stationed at Mountain Home AFB in the MHRC.

BO 2.2.3 Public Hearings and Agency Concerns

The Air Force conducted public hearings on the Draft EIS in communities in the immediate vicinity of Boise AGS, as well as in the vicinity of potential airspace and ranges. Hearings were held during the week of February 27, 2012, and the public comment period extended through March 14, 2012. There were a total of 329 attendees who signed in at the public hearings. During the public hearings, people were given the opportunity to provide oral and/or written comments on the F-35A Training Basing Draft EIS. Some of the comments and questions are summarized below in Table BO 2.2–6, along with the location in the EIS where the comment is addressed.

Table BO 2.2–6. Issues and Questions Identified During Draft EIS Public Review

Issues and Questions	*Section in EIS or Comment Response Where Issue Is Addressed*			
	Boise AGS	**Holloman AFB**	**Luke AFB**	**Tucson AGS**
Do we need the F-35A?	1.1; 1.3	1.1; 1.3	1.1; 1.3	1.1; 1.3
How does the F-35A noise compare with that of other military aircraft?	3.2; BO 3.2.1	3.2; HO 3.2.1	3.2; LU 3.2.1	3.2; TU 3.2.1
How do the different F-35A alternatives and scenario impacts compare?	BO 3.1.2 through BO 3.15.2; Response NP-13	HO 3.1.2 through HO 3.15.2; Response NP-13	LU 3.1.2 through LU 3.15.2; Response NP-13	TU 3.1.2 through TU 3.15.2; Response NP-13
What is No Action?	2.5	2.5	2.5	2.5
Explain noise measures in the EIS.	3.2; Appendix B	3.2; Appendix B	3.2; Appendix B	3.2; Appendix B
What are the F-35A impacts on property values or property tax revenues?	3.9.2; BO 3.11.1.2; Appendix B.2.7; Response SO-13	3.9.2; HO 3.11.1.2; Appendix B.2.7; Response SO-13	3.9.2; LU 3.11.1.2; Appendix B.2.7; Response SO-13, SO-31	3.9.2; TU 3.11.1.2; Appendix B.2.7; Response SO-13
Could residents lose their homes or businesses as a result of F-35A noise?	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26
Test flyovers of communities are needed for a community survey before an EIS can be prepared.	Response SO-7, NP-13	Response SO-7, NP-13	Response SO-7, NP-13	Response SO-7, NP-13
Would the Air Force regulate flight altitudes, training times, takeoffs and landings, or institute other mitigations to reduce noise impacts?	Response NP-33	Response NP-33	Response NP-33	Response NP-33
Will schools be retrofitted or closed due to noise impacts?	2.8.3; Response SO-32, SO-37		2.8.3; Response SO-32, SO-37	2.8.3; Response SO-32, SO-37
How would the basing of the F-35A mission affect Arizona State land use laws regarding property near a military airport?			LU 3.2.1; LU 3.2.2; LU 3.10.1; LU 3.10.2	TU 3.10.3.1
Can the F-35A train in local airspace?	2.2.1; BO 2.2	2.2.1; HO 2.2	2.2.1; LU 2.2	2.2.1; TU 2.2
What sonic booms are associated with the F-35A?	BO 3.2.2	HO 3.2.2	LU 3.2.2	TU 3.2.2
What would the impact on recreational areas under the airspace be?	BO 3.10.2.1; BO 3.10.2.2	HO 3.10.2.1; HO 3.10.2.2	LU 3.10.2.1; LU 3.10.2.2	TU 3.10.2.1; TU 3.10.2.2
What low-level overflights would occur?	BO 2.2.1; BO 3.1.2	HO 2.2.1; HO 3.1.2	LU 2.2.1; LU 3.1.2	TU 2.2.1; TU 3.1.2
What would the impact on communities under the airspace be?	BO 3.10.1; BO 3.10.2; BO 3.11.1; BO 3.11.2; Response SO-6, SO-45	HO 3.2.2; HO 3.10.1; HO 3.10.2; HO 3.11.1; HO 3.11.2; Response SO-6, SO-20, SO-45	LU 3.10.1; LU 3.10.2; LU 3.11.1; LU 3.11.2; Response SO-6, SO-45	TU 3.10.1; TU 3.10.2; TU 3.11.1; TU 3.11.2; Response SO-6, SO-45
How do we make damage claims for noise impacts?	BO 2.8.4	HO 2.8.4	LU 2.8.4	TU 2.8.4
What would the air quality emissions and air pollution effects be?	BO 3.3	HO 3.3	LU 3.3	TU 3.3

Issues and Questions	***Section in EIS or Comment Response Where Issue Is Addressed***			
	Boise AGS	**Holloman AFB**	**Luke AFB**	**Tucson AGS**
How will F-35As use Davis-Monthan AFB?				2.3.4; TU 3.1.1.1; TU 3.4.1.2
What are the safety risks from pilot error or mechanical malfunction?	BO 3.4.1; BO 3.4.2	HO 3.4.1; HO 3.4.2	LU 3.4.1; LU 3.4.2	TU 3.4.1; TU 3.4.2
How are pilots trained for such a sophisticated aircraft?	2.4.3	2.4.3	2.4.3	2.4.3
Are there special safety issues associated with a single-seat, single-engine aircraft?	BO 3.4.2.2	HO 3.4.2.2	LU 3.4.2.2	TU 3.4.2.2
What testing would occur before training aircraft beddown and flight over cities?	2.4.3.2	2.4.3.2	2.4.3.2	2.4.3.2
What chaff and flare use would occur with the F-35A?	2.4.5; BO 3.4.2.2	2.4.5; HO 3.4.2.2	2.4.5; LU 3.4.2.2	2.4.5; TU 3.4.2.2
Would the potential for fire increase with the F-35A?	2.4.5; BO 3.4.2.2; Response SO-8	2.4.5; HO 3.4.2.2; Response SO-8	2.4.5; LU 3.4.2.2; Response SO-8	2.4.5; TU 3.4.2.2; Response SO-8
Would jet fuel be dumped?	BO 3.4.2.2	HO 3.4.2.2	LU 3.4.2.2	TU 3.4.2.2
Would soils or water be impacted?	BO 3.5; BO 3.7	HO 3.5; HO 3.7	LU 3.5; LU 3.7	TU 3.5; TU 3.7
What would the impacts on wildlife and sensitive species be?	BO 3.6; BO 3.8; Appendix B.2.6	HO 3.6; HO 3.8; Appendix B.2.6	LU 3.6; LU 3.8; Appendix B.2.6	TU 3.6; TU 3.8; Appendix B.2.6
How would domestic and ranch animals be impacted?	2.8; Appendix B.2.6	2.8; Appendix B.2.6	2.8; Appendix B.2.6	2.8; Appendix B.2.6
What traditional or historic impacts would occur?	BO 3.9.1; BO 3.9.2	HO 3.9.1; HO 3.9.2	LU 3.9.1; LU 3.9.2	TU 3.9.1; TU 3.9.2
Would land use under the airspace be impacted?	BO 3.10.1; BO 3.10.2; BO 3.11.2	HO 3.10.1; HO 3.10.2; HO 3.11.2	LU 3.10.1; LU 3.10.2; LU 3.11.2	TU 3.10.1; TU 3.10.2; TU 3.11.2
How would existing land use statutes be affected?	3.2.2; BO 3.11.2.2	3.2.2	3.2.2; LU 3.2; LU 3.10	3.2.2; TU 3.10.3.1
What would the impacts on the local economy be?	BO 3.10.1.2; BO 3.10.2; BO 3.11.1.2	HO 3.10.1.2; HO 3.10.2; HO 3.11.1.2	LU 3.10.1.2; LU 3.10.2; LU 3.11.1.2	TU 3.10.1.2; TU 3.10.2; TU 3.11.1.2
How many jobs would be associated with the F-35A basing?	BO 3.11.1.2; Response SO-21, SO-25	HO 3.11.1.2; Response SO-21, SO-25	LU 3.11.1.2; Response SO-21, SO-25	TU 3.11.1.2; Response SO-21, SO-25
Would noise impact tourism or the ability to enjoy the natural environment?	BO 3.10.2	HO 3.10.2	LU 3.10.2	TU 3.10.2
Who will pay for the impact on school funding and neighborhoods?	2.8.2	2.8.2	2.8.2	2.8.2
A comprehensive community cost-benefit study is needed.	Response DO-10, SO-13	Response DO-10, SO-13	Response DO-10, SO-13	Response DO-10, SO-13
How would minorities and low-income populations be impacted?	BO 3.12.1; BO 3.12.2	HO 3.12.1; HO 3.12.2	LU 3.12.1; LU 3.12.2	TU 3.12.1; TU 3.12.2
What would the health impacts on children and young adults be?	BO 3.12.2.2; Appendix B.2.5	HO 3.12.2.2; Appendix B.2.5	LU 3.12.2.2; Appendix B.2.5	TU 3.12.2.2; Appendix B.2.5
What would the noise effects on schools or children be?	BO 3.2.1.2; BO 3.12.2.2; Appendix B.2.5	HO 3.2.1.2; HO 3.12.2.2; Appendix B.2.5	LU 3.2.1.2; LU 3.12.2.2; Appendix B.2.5	TU 3.2.1.2; TU 3.12.2.2; Appendix B.2.5

BO 3.0 Boise AGS Affected Environment/Environmental Consequences

BO 3.1 Airspace Management and Use

BO 3.1.1 Base

BO 3.1.1.1 Base Affected Environment

The airspace resource area definition and analysis methodology, as well as key terms and definitions, are discussed in detail in Chapter 3, Section 3.1. The Boise Air Terminal Airport airspace environment provides full-service capabilities that support both military and civil aircraft operations. The airport is located within an airspace region managed and controlled by the Salt Lake City ARTCC. This ARTCC has delegated Class C airspace surrounding this airport to the Federal Aviation Administration (FAA)-operated Boise Terminal Radar Approach Control (TRACON) facility, which provides air traffic control (ATC) services to the airport traffic and other aircraft transiting through this area. Class C airspace is established around those airports having an operational control tower and a moderate level of air traffic operations, as described in Chapter 3, Section 3.1. All aircraft, including those operating under Visual Flight Rule (VFR) conditions, are required to establish radio communications with the Boise TRACON prior to entering this Class C airspace. This enhances flight safety for all aircraft operating within this terminal airspace, including military aircraft operating from this airfield.

The Boise Air Terminal Airport Air Traffic Control Tower (ATCT) is responsible for aircraft operations within the airfield environment. This airfield is 2,871 feet MSL and consists of two parallel runways: Runway 10L/28R, with a 10,000-foot length, and 10R/28L, with a 9,763-foot length. This airfield configuration, coupled with the navigational aids, provide this airport with dual runway and instrument approach and departure capabilities necessary to fully serve both civil and military aircraft operational needs. An asphalt assault strip located about a mile south of the parallel runways is used by the Army National Guard and other units from around the country for assault landing training. The Boise ATCT does control aircraft activities at this assault strip. However, because the assault strip is not currently used by the 124 FW it is not a consideration in the beddown of F-35A at Boise AGS.

Boise AGS and the 124 FW facilities are located on the south side of the airfield closest to Runway 10R/28L, which is the primary runway used by based military aircraft. Historically, A-10s have used Runway 10R (arriving/departing to the east) approximately 60 percent of the time and Runway 28L (arriving/departing to the west) the other 40 percent. The northern parallel Runway 10L/28R is used by the A-10s less than 1 percent of the time. The parallel runway configuration expedites the air traffic flow during peak traffic periods by allowing one aircraft to be positioned for takeoff on one runway while another is arriving or departing on the adjacent runway. This is an important attribute for military operations and readiness when operating from a joint civil/military facility such as the Boise Air Terminal Airport. As shown in Table BO 2.1–1, over 129,000 airfield operations were conducted at the Boise Air Terminal Airport in 2009. This level of operations serves as a benchmark for comparing the current Boise Air Terminal Airport operational level with the added airfield operations that would occur with the proposed beddown of the F-35A Pilot Training Center.

BO 3.1.1.2 Base Environmental Consequences

Under Scenario B1, the projected F-35A aircraft operations at Boise AGS, coupled with the existing A-10 mission and anticipated increases in civil aircraft activities, would increase the 2009 baseline airfield operations by nearly 35 percent (44,303 increase). Projected F-35A operations would account for less than a third of this operational increase. Predicted growth in civilian operations accounts for the remainder of the increase. Under Scenarios B2 and B3, the A-10 mission would be relocated from Boise AGS, bringing the A-10 airfield operations to zero. Taken in combination with A-10 relocation and anticipated civil aviation growth, addition of the F-35A operations would increase airfield operations by 41 percent and 50 percent, respectively, under Scenarios B2 and B3. Operational increases resulting from any of the three scenarios would be within the higher levels previously projected for this airport in the Airport Master Plan and Noise Compatibility Study. Therefore, the F-35A operations could be accommodated within the Boise Air Terminal Airport airspace, airfield environment, and ATC system capabilities without adversely affecting the overall use and management of this airspace. No modifications would be required for this airspace structure or airport flight patterns and procedures to accommodate the F-35A aircraft operations.

BO 3.1.2 Airspace

BO 3.1.2.1 Airspace Affected Environment

Special Use Airspace and Military Training Routes

The SUA currently used to support the 124 FW flight training activities consists of the MOAs and Restricted Areas depicted in Figure BO 2.2–1 and described in Table BO 3.1–1. The baseline annual sortie-operations for this airspace by aircraft types are shown in Table BO 2.2–1. The Saylor Creek Range (within R-3202) and Juniper Butte Range (within R-3204) contain varied target sets for supporting air-to-ground weapons training. The 124 FW maintains and operates simulated threat systems within the ranges that provide realistic electronic combat training.

Several Victor Airways and Jet Routes traverse this region for use in transiting Instrument Flight Rule (IFR) air traffic. These routes are sufficiently separated from the SUA so as not to be affected by military flight activities conducted within this airspace. The Salt Lake ARTCC provides separation between military and civil aircraft if necessary to route IFR air traffic through this SUA when in use.

Two common routes flown by VFR general aviation aircraft in this area providing visual or navigational references when flying south or southeast of Boise include one that follows State Highway 51 between Mountain Home AFB and points south towards Elko, Nevada, and another that follows the Snake River, Interstate 84 (I–84), or Victor Airways V-253 and V-269 between Boise and points southeast towards Twin Falls, Idaho, and Jackpot, Nevada. VFR flights along Highway 51 would transit the Jarbidge North/South and Paradise North/South MOAs, where both general aviation and military pilots exercise "see and avoid" procedures to remain clear of each other while in this airspace. The Boise TRACON and Mountain Home AFB Radar Approach Control (RAPCON) can provide traffic advisories to VFR aircraft as radio and radar coverage permit.

Table BO 3.1–1. Description of Primary Use Airspace for Projected F-35A Use

Airspace	*Airspace Type*	*Airspace Floor*	*Airspace Ceiling*	*Airspace Published Use Time (local)*[1]	*Managed By*
Jarbidge North/South	MOA with overlying ATCAA	100 feet AGL	FL500	0730–2200	366 FW
Owyhee North/South	MOA with overlying ATCAA	100 feet AGL	FL500	0730–2200	366 FW
Paradise North/South	MOA with overlying ATCAA	10,000 feet MSL or 3,000 feet AGL, whichever is higher	FL500	0730–2200	366 FW
Saddle A/B	MOA with overlying ATCAA	10,000 feet MSL (A) 8,000 feet MSL (B)	FL290	Intermittent by NOTAM	124 FW
R-3202 Low/High (Saylor Creek)	Restricted airspace	Surface	FL290	0730–2200	366 FW
R-3204 A/B (Juniper Butte)	Restricted airspace	Surface	FL290	0730–2200	366 FW
IR-301/307	Reversed direction MTRs	100 feet AGL	13,000 feet MSL	Continuous or by NOTAM	124 FW
IR-302/305	Reversed direction MTRs	100 feet AGL	13,000 feet MSL	Continuous or by NOTAM	124 FW
VR-316/319	Reversed direction MTRs	100 feet AGL	10,000 feet MSL	Continuous or by NOTAM	124 FW
VR-1302[1]	MTR	100 feet AGL	1,500 feet AGL	Continuous	124 FW

[1] Monday through Friday, other times by NOTAM [Notice to Airmen].

The U.S. Bureau of Land Management (BLM) and Idaho Department of Fish and Game (IDFG) require occasional use of the MOAs for fire spotting/response, game surveys, and other management activities. These flights are coordinated with Mountain Home AFB to ensure both agency and military aircrews are aware of the time, duration, location, and altitudes of their respective operations.

The MTRs shown in Figure 2.2–1 and described in Table BO 2.2–2 are managed by the 124 FW and projected for use by the F-35As. As noted in Table BO 2.2–2, six MTRs are paired as reverse courses of each other with virtually the same segment widths and altitudes. The daily average use of each MTR is at most one sortie-operation, based on 243 flying days per year.

Auxiliary Airfield

Mountain Home AFB. The close proximity of Mountain Home AFB (33 miles southeast of Boise) provides the 124 FW with an alternate airfield for practicing runway operations. The airfield at Mountain Home AFB is 2,996 feet MSL and has one runway (12/30) that is 13,501 feet in length with instrument approach and departure procedures established for both runway directions. Radar ATC services for the terminal airspace surrounding this airfield are provided by the Air Force–operated RAPCON facility. RAPCON reported 17,232 air traffic operations (radar services to aircraft arrivals, departures, and overflights) during FY2009. The Mountain Home AFB ATCT is responsible for airfield operations within the Class D airspace surrounding the airfield (5-mile radius from the surface to 2,500 feet AGL). The ATCT reported

24,872 airfield operations for FY2009 (Air Force 2010a). However, as described in the Mountain Home AFB 2006 Air Installation Compatibility Use Zone (AICUZ) study (Mountain Home AFB 2006) and 2009 *Categorical Exclusion for Plus-Up of Republic of Singapore Air Force F-15SGs* (Mountain Home AFB 2009), aircraft operations are projected to increase relative to numbers reported in FY2009 reaching a representative baseline operations tempo of 30,062 annual operations.

BO 3.1.2.2 Airspace Environmental Consequences

Special Use Airspace and Military Training Routes

Table BO 2.2–1 compares the estimated number of sortie-operations that would be conducted in the MOAs and Restricted Areas under Scenarios B1, B2, and B3 with the baseline annual use of this airspace. Based on these projections, sortie-operations in the Jarbidge North MOA/ATCAA and both R-3202 and R-3204 would increase nearly 22 percent under Scenario B1 with the A-10s still present. Without the A-10s under Scenarios B2 and B3, sortie-operations in this airspace would increase 21 and 43 percent, respectively. Sortie-operations in the Owyhee North MOA/ATCAA would increase 20 percent under Scenario B1 up to nearly 43 percent under Scenario B3. The Jarbidge South, Paradise North/South, and Owyhee South MOAs/ATCAAs would be scheduled together and operated as a single airspace unit. Therefore, sortie-operations in these airspace units are generally the same. Under Scenario B1, sortie-operations in these airspace units would increase by 7 percent, while sortie-operations under Scenario B2 and B3 would increase by 12 percent and 19 percent, respectively. Sortie-operations in the Saddle A and B MOAs/ATCAAs would increase by about 58 percent under Scenarios B1, nearly 94 percent under Scenario B2, and up to 152 percent under Scenario B3. Supersonic operations are authorized in each of these areas with the exception of the Saddle A and B MOAs/ATCAAs. A waiver is required for those areas shown in Table BO 2.2–1 where supersonic operations are permitted below 30,000 feet MSL. A new waiver would be required to assess and approve supersonic operations by the F-35A aircraft in this airspace.

Operational requirements associated with the F-35A training activities would not require any changes to the current lateral or vertical configuration of this SUA. There would be competing needs for this airspace use by the Mountain Home AFB and 124 FW-based aircraft, with the F-35A training program requiring continued close coordination of airspace scheduling to meet mission requirements. Detailed scheduling and prioritization would continue to be required between the respective scheduling agencies to help ensure all training and other mission requirements are met. Additionally, continued close coordination between the military and the FAA should minimize any potential airspace utilization impacts associated with training periods that utilize the MOAs/ATCAAs. Therefore, with coordination, flight training under Scenarios B1, B2, and B3 would not result in any adverse effects on the use and management of the SUA and the other airspace in the region.

It is projected that each F-35A squadron would conduct approximately 253 annual low-level training sorties (average of 1 per flying day) using the MTRs listed in Table BO 2.2–2. Scenario B3 would increase this annual total to 760 sorties, for an average of 3 sorties per flying day. This increase would not adversely affect airspace use and management in the region. Any new land uses that may affect MTR use are evaluated by the responsible military agency, as necessary, to ensure operational safety is maintained for all concerned.

Auxiliary Airfield

Mountain Home AFB. The beddown of F-35A training aircraft would also result in increased use of Mountain Home AFB as an auxiliary airfield for 124 FW F-35A aircraft, as shown in Table BO 2.2–4. Each 24 F-35A aircraft increment is projected to conduct approximately 7,091 operations annually at Mountain Home AFB while performing practice approaches and landings/takeoffs. Scenario B1 would result in a 23 percent increase over current levels; Scenario B2, a 47 percent increase; and Scenario B3, a 71 percent increase. Relocation of the 124 FW A-10s would reduce transient aircraft airfield operations to some extent because A-10 aircraft based at Boise AGS currently conduct limited training operations at Mountain Home AFB; however, this reduction would be negligible. The operational increases at Mountain Home AFB resulting from flight operations of the F-35A training aircraft at Boise AGS could be accommodated within the current airfield and airspace environment and ATC system capabilities without adversely affecting the overall use and management of this environment. No airspace modifications or changes to the airport arrival and departure procedures would be required to accommodate added F-35A training operations at this auxiliary location.

BO 3.2 Noise

Noise, which is defined simply as unwanted sound, has the potential to affect several environmental resource areas. Comments received during scoping covered a broad range of issues and requested a comprehensive presentation of noise effects. This section will describe noise effects on human annoyance and health, as well as physical effects on structures in the Boise AGS region of influence (ROI). Noise impacts on biological, land use, socioeconomic, and cultural resources are described briefly in this section and are discussed in more detail in separate sections dealing with those environmental resources. A discussion of the methods used to assess noise impacts throughout this EIS can be found in Chapter 3, Section 3.2. A brief summary of the different measurements used to quantify noise is provided for convenience below.

Different noise measurements (or metrics) quantify noise. These noise metrics are as follows:

- DNL (Day–Night Average Sound Level) combines the levels and durations of noise events, the number of events over a 24-hour period, and more-intrusive nighttime noise to calculate an average noise exposure.
- DNL_{mr} (Onset Rate-Adjusted Day–Night Average Sound Level) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace units, DNL_{mr} is calculated based on the average number of operations per day in the busiest month of the year.
- CDNL (C-Weighted Day–Night Average Sound Level) is a day–night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of single impulsive noises, such as sonic booms.
- L_{max} (Maximum Noise Level) is the highest noise level reached during an event, such as an aircraft overflight.
- SEL (Sound Exposure Level) accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.
- SEL_r (Onset Rate-Adjusted Sound Exposure Level) is the same as SEL but accounts for the onset-rate of a sound, which can make a noise seem louder.
- L_{eq} (Equivalent Sound Level) represents aircraft noise levels averaged over a specified time period. The L_{eq} is useful for considering noise effects such as during a school day ($L_{eq(SD)}$; 7:00 a.m. to 4:00 p.m.).

Different metrics measure different impacts. Annoyance represents the most common noise impact. There is a correlation between the percentages of people in a community highly annoyed and the average noise level measured using the DNL metric. Impulsive noise, as measured in CDNL, is annoying to more people than DNL.

BO 3.2.1 Base

BO 3.2.1.1 Base Affected Environment

The Boise Air Terminal Airport is a joint use airfield that currently accommodates several varieties of civilian and military aircraft.

The Boise Air Terminal Airport maintains an active Noise Compatibility Program, including measures to abate aircraft noise, avoid incompatible development of nearby lands, and mitigate the impact of noise on incompatible land uses. In 2004, Boise Air Terminal Airport released an updated Federal Aviation Regulation (FAR) Part 150 study that describes current noise levels and documents adoption of several noise abatement and land use control measures. The DNL contours shown in Figure BO 3.2–1 reflect the 2004 Boise Airport Part 150 Study Update (Boise 2006), as updated to reflect FY2009 civilian annual airfield operations counts, and were calculated using the FAA's Integrated Noise Model.

Under baseline conditions, approximately 89 acres and 142 residents are affected by noise levels exceeding 65 dB DNL in areas not owned by Boise AGS or the airport (see Section BO 3.2.1.2, Table BO 3.2–2). There are no residences on the AGS or airport; thus, no residents on the installation/airport are affected by elevated noise levels. Noise levels at several representative noise-sensitive locations under baseline conditions are presented in Section BO 3.2.1.2, Table BO 3.2–3. The areas in the vicinity of these locations (see Figures BO 3.2–1, BO 3.2–2, and BO 3.2–3) would experience similar aircraft noise levels and noise impacts. Under baseline conditions, each of the representative locations studied experiences a DNL ranging from 49 dB to 68 dB. Of the locations studied, only the Jehovah's Witnesses Kingdom Hall (Location No. 8) experiences a noise level greater than 65 dB DNL. The locations experience between 1 and 11 overflights per daytime hour, on average, exceeding an indoor noise level of 50 dB L_{max}, a noise level at which some speech interference may occur, with windows open. With windows closed, the average number of indoor noise events per hour exceeding 50 dB L_{max} ranges from 0 to 4. At the four schools studied, $L_{eq(SD)}$ does not exceed 65 dB. The percentage of persons expected to be awakened at least once per night by aircraft noise if all windows are left open ranges from 12 percent to 46 percent under baseline conditions. If windows are closed, the amount of noise attenuation provided by the structure increases, making it less likely that persons who are sleeping will be awakened. If all windows are closed, the percentage of persons awakened at least once per night ranges from 2 to 31 percent. Under baseline conditions, no buildings on Boise AGS or the Boise Airport Air Terminal are exposed to noise levels greater than 80 dB DNL. Employees at Boise AGS are covered by U.S. Department of Defense (DoD) occupational hearing protection regulations, and employees at Boise Air Terminal Airport are covered by Occupational Safety and Health Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH) regulations.

BO 3.2.1.2 Base Environmental Consequences

Table BO 3.2–1 lists noise levels (SEL) associated with individual A-10 and F-35A aircraft overflights at a single location on the ground for purposes of comparison. The locations of aircraft ground tracks, as well as aircraft altitudes, airspeeds, and engine power settings used in this analysis, are representative of current A-10 or projected F-35A operations based on pilot input. Noise levels were generated using NOISEMAP Version 7.3 and the same aircraft operations data used to generate time-averaged noise levels (noise contours) presented later in this section. Note that actual overflight noise levels vary from flight to flight due to variations in aircraft location and configuration, as well as weather conditions and other factors. Under baseline conditions and beddown scenarios, aircraft sometimes fly in groups known as "formations." Since SEL is an exposure-based metric, doubling the number of aircraft flying overhead results in a combined SEL that is 3 dB higher than the individual overflights. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL as listed in Table BO 3.2–1. West Junior High School was selected as the location for the analysis because it is near frequently used A-10 and proposed F-35A flight paths. F-35A aircraft departures in both military and afterburner power settings are approximately 20 dB louder than A-10 departures at the location studied. The F-35A is expected to turn off the afterburner soon after leaving the airfield, and at the location studied, afterburner departures would generate approximately the same SEL as military power departures. F-35A arrivals would also be substantially louder (approximately 30 dB) than A-10 arrivals at the location studied. F-35A flight paths would be very close to West Junior High School. F-35A aircraft are expected to fly almost directly over West Junior High School, and noise levels would be high (approximately 98 dB) despite the relatively low engine power setting used for maneuvering in the traffic pattern. A-10 aircraft based at Boise AGS currently conduct closed patterns very infrequently; therefore, A-10 closed pattern overflight noise levels are not listed. The F-15 aircraft that recently bedded down temporarily at Boise AGS generate a noise level (SEL) that is intermediate between that generated by an F-35A and that generated by an A-10 aircraft in most typical flight configurations.

Table BO 3.2–1. Projected Noise Levels from Currently Based and F-35A Aircraft at a Specific Location on the Ground

Aircraft	*Operation Type*	*Engine Power*	*Airspeed (knots)*	*Altitude (feet AGL)*	*Slant Distance (feet)*	*SEL (dB)*
F-35A (Military power)	Departure	100% ETR	300	2,569	4,720	100
F-35A (Afterburner power)		100% ETR	250	2,661	4,762	101
A-10		6700 NF	160	3,344	5,277	81
F-35A	Arrival	40% ETR	190	883	1,457	95
A-10		5225 NF	130	558	4,569	65
F-35A	Closed Pattern	40% ETR	210	868	1,023	98

Note: Noise levels presented were calculated at the West Junior High School for the closest representative departure, arrival, or closed pattern flight that comes closest to the location. Actual individual overflight noise levels vary from the noise levels listed because of variations in aircraft configuration, flight track, altitude, and atmospheric conditions. Representative noise levels were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate noise contours.
Key: ETR=engine thrust request; NF=fan speed.

NOISEMAP Version 7.3 was used to model military aircraft operations noise, and the Integrated Noise Model was used to model civilian aircraft operations noise. Figures BO 3.2–1, BO 3.2–2, and BO 3.2–3 show DNL contours under Scenarios B1, B2, and B3, respectively, overlaid on baseline noise contours. Noise levels presented for beddown scenarios reflect expected growth in civilian operations over the scheduled F-35A beddown time period. The F-35A beddown is anticipated to begin in FY2013 and, for analysis, it was assumed the beddown would be completed within 4 years. The off-installation/airport land area affected by noise levels greater than 65 dB DNL would increase by approximately 2,943 acres, 4,949 acres, and 6,869 acres under Scenarios B1, B2, and B3, respectively, relative to baseline conditions (see Table BO 3.2–2). The estimated number of off-installation residents affected under Scenarios B1, B2, and B3 would increase to 3,104, 5,470, and 10,119 residents, respectively (see Table BO 3.2–2). Specific operations have been identified for Gowen Field, which would mitigate noise impact to population exposed to 65 dB DNL or above. The mitigation operations include (1) instructing the departing aircraft climb to an altitude of 1,000 to 3,000 feet AGL and hold at that altitude, atmospheric conditions permitting, until away from the city before climbing, (2) using runway 10R furthest from the city for departures, and (3) turning 30 degrees towards the south when departing. When applied to the Boise alternative scenarios, these mitigation measures would result in a reduction of the potential population exposed to 65 dB DNL or higher noise levels to 2,547, 3,956, and 5,886 under Scenarios B1, B2, and B3, respectively (see Table BO 3.2–2). Please see Section 2.8, Mitigations, for more information. Persons exposed to increased noise levels, particularly noise levels greater than 65 dB DNL, are expected to experience increased annoyance, as described in Chapter 3, Table 3–3. Persons not within the 65 dB DNL noise contour would experience aircraft noise, although with less frequency and/or intensity, and could become highly annoyed as a result of the noise. The estimates of population affected by elevated noise levels in Table BO 3.2–2 represent the best available data from the 2010 census. Off-installation populations were estimated by proportioning the area of the census blocks affected by noise contours. This method counts permanent residents only, and does not estimate persons residing in hotels and other temporary accommodations.

The primary reason for the increase in noise levels associated with the beddown actions is that the F-35A is substantially louder than the A-10 aircraft, helicopters, and civilian aircraft that currently use the airfield (see Table BO 3.2–1). The F-35A was designed to meet specific aerial combat performance requirements that are mutually exclusive of noise-reducing design elements incorporated into modern civilian aircraft. Another factor contributing to increased DNL noise levels is the increase in flights during the late-night period between 10:00 p.m. and 7:00 a.m. F-35A training requirements require certain training events to occur after dark, and in some circumstances, aircraft involved in these sorties would return to Boise Air Terminal Airport after 10:00 p.m. Under Scenarios B1, B2, and B3, approximately 9, 9, and 10 percent, respectively, of returning F-35A sorties would occur after 10:00 p.m. While the total number of F-35A operations conducted after 10:00 p.m. is relatively low, these generate a disproportionately large amount of annoyance, as reflected in the DNL noise metric.

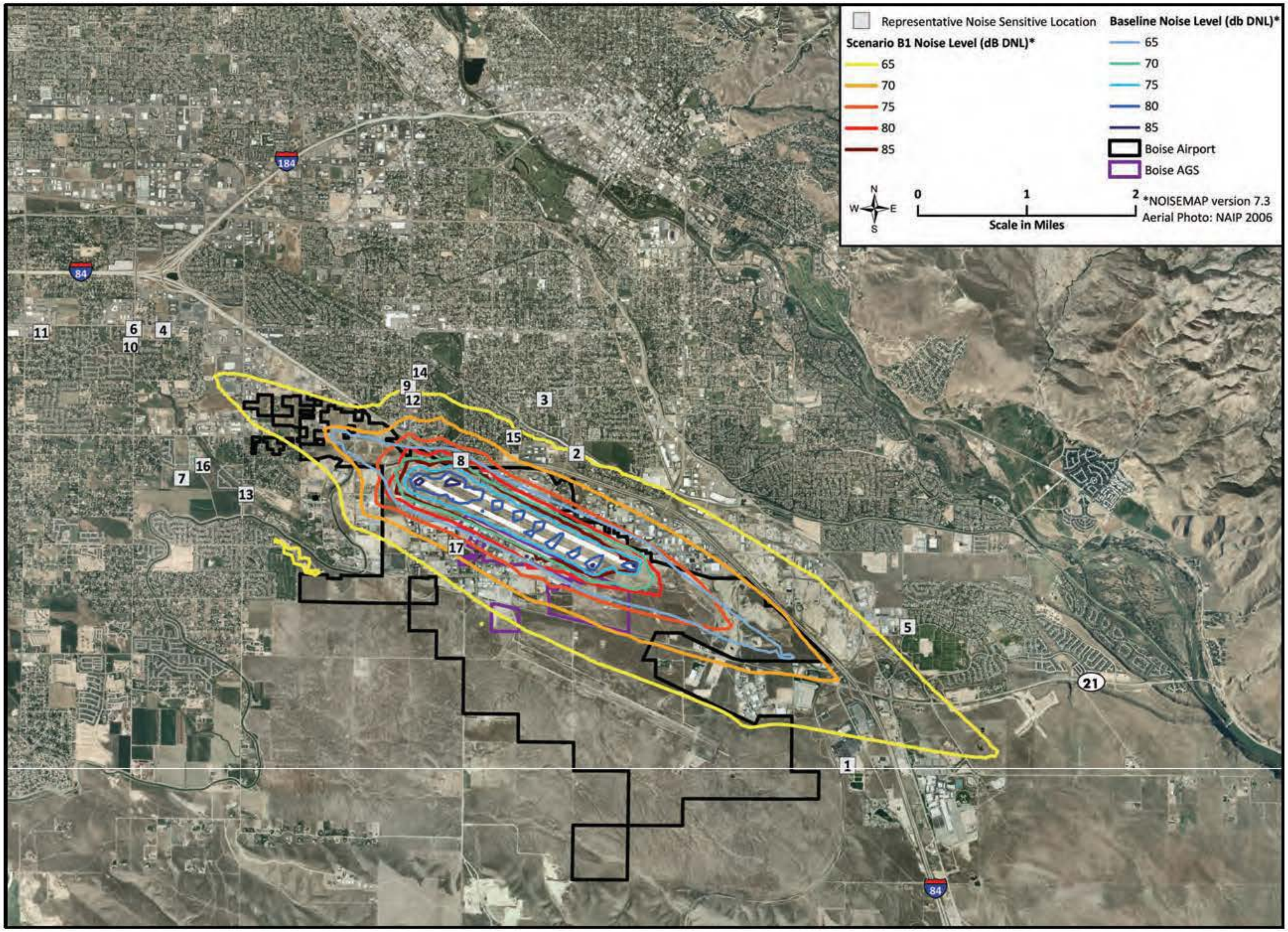


Figure BO 3.2–1. Scenario B1 and Baseline Noise Contours

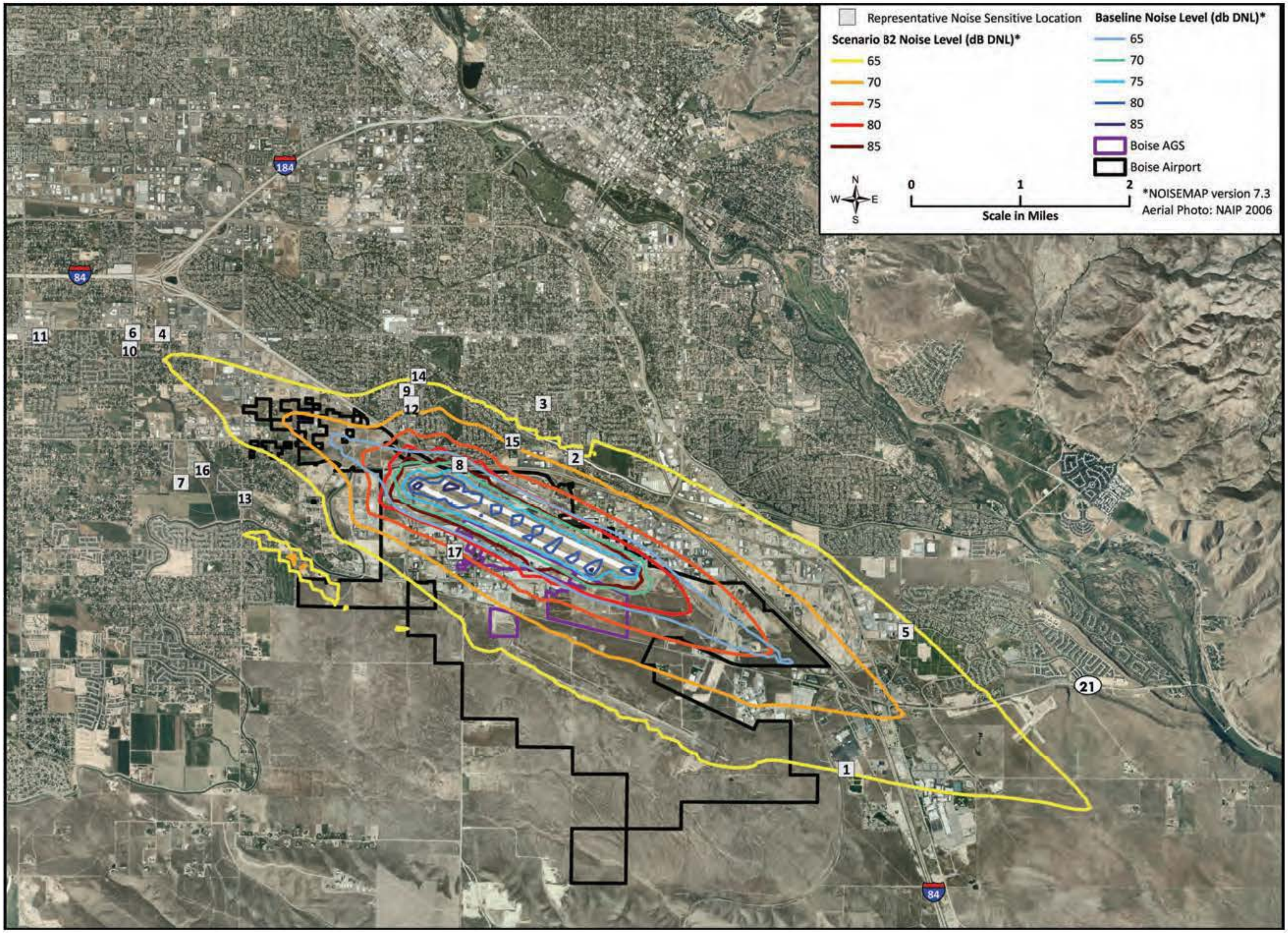


Figure BO 3.2–2. Scenario B2 and Baseline Noise Contours

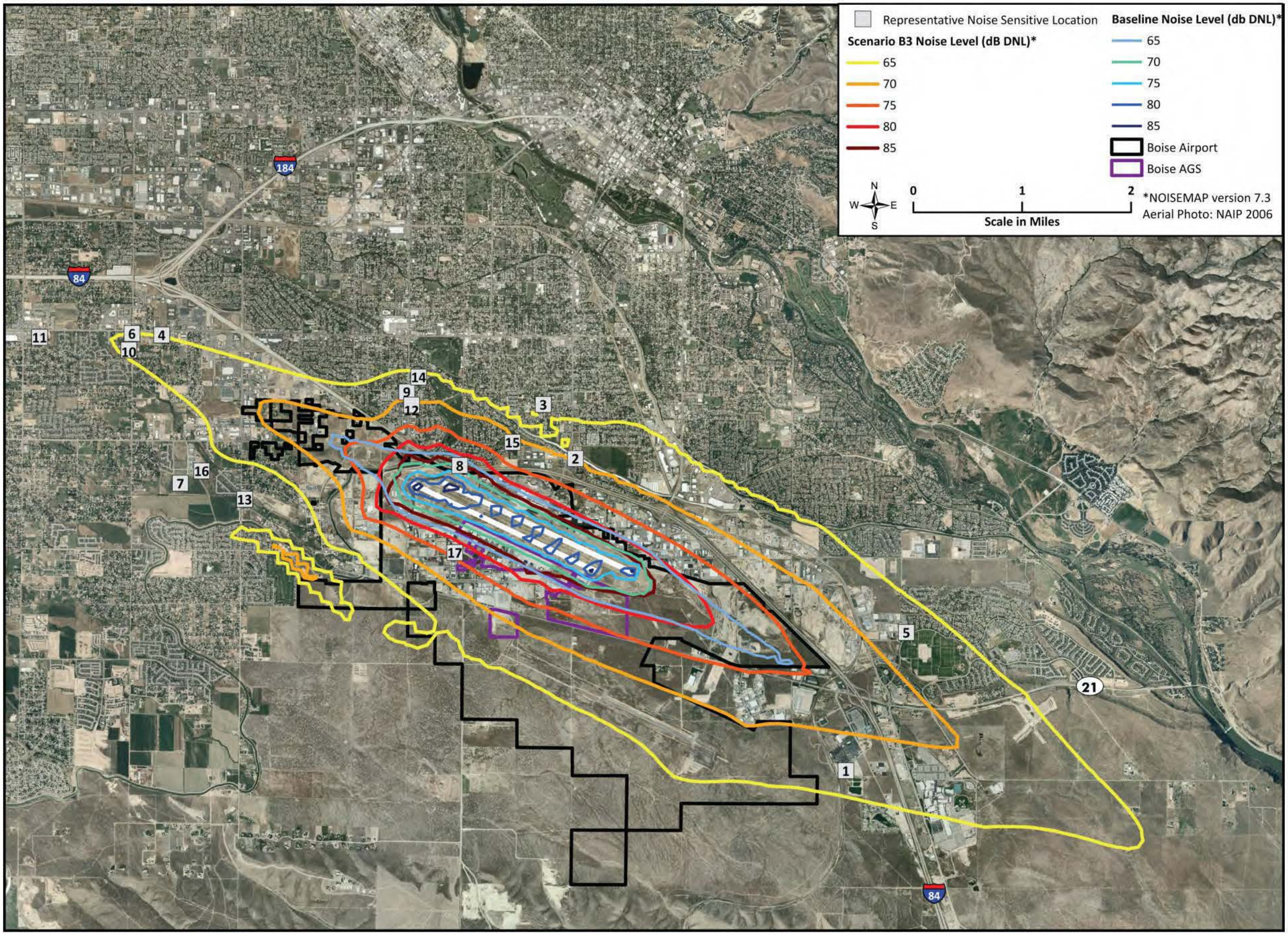


Figure BO 3.2–3. Scenario B3 and Baseline Noise Contours

Table BO 3.2–2. Population and Acreage Under Noise Contours Near Boise AGS, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation/ Airport)*		*Population Affected (On-Installation/ Airport)*		*Total Area Affected (Off-Installation/ Airport)*		*Total Area Affected (On-Installation/ Airport)*	
	Number	**Change**	**Number**	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions								
Total ≥ 65	**142**	**N/A**	**0**	**N/A**	**89**	**N/A**	**1,241**	**N/A**
65–69	131	N/A	0	N/A	82	N/A	614	N/A
70–74	11	N/A	0	N/A	7	N/A	244	N/A
75–79	0	N/A	0	N/A	0	N/A	278	N/A
80–84	0	N/A	0	N/A	0	N/A	100	N/A
≥ 85	0	N/A	0	N/A	0	N/A	5	N/A
Scenario B1 (24 Aircraft)								
Total ≥ 65	**3,104**	**2,962**	**0**	**0**	**3,032**	**2,943**	**2,795**	**1,554**
65–69	2,157	2,026	0	0	2,357	2,275	682	68
70–74	590	579	0	0	519	512	827	583
75–79	289	289	0	0	129	129	486	208
80–84	68	68	0	0	24	24	280	180
≥ 85	0	0	0	0	3	3	520	515
Scenario B2 (48 Aircraft)								
Total ≥ 65	**5,470**	**5,328**	**0**	**0**	**5,038**	**4,949**	**3,578**	**2,337**
65–69	3,894	3,763	0	0	3,395	3,313	1,138	524
70–74	955	944	0	0	1,320	1,313	749	505
75–79	457	457	0	0	253	253	657	379
80–84	142	142	0	0	60	60	378	278
≥ 85	22	22	0	0	10	10	656	651
Scenario B3 (72 Aircraft)								
Total ≥ 65	**10,119**	**9,977**	**0**	**0**	**6,958**	**6,869**	**4,020**	**2,779**
65–69	7,521	7,390	0	0	4,411	4,329	1,350	736
70–74	1,755	1,744	0	0	2,012	2005	676	432
75–79	530	530	0	0	406	406	780	502
80–84	258	258	0	0	108	108	452	352
≥ 85	55	55	0	0	21	21	762	757
Mitigated Scenario B1 (24 Aircraft)								
Total ≥ 65	**2,547**	**2,405**	**0**	**0**	**3,338**	**3,249**	**2,760**	**1,519**
65–69	1,756	1,625	0	0	2,539	2,457	808	194
70–74	589	578	0	0	652	645	749	505
75–79	200	200	0	0	139	139	450	172
80–84	2	2	0	0	8	8	301	201
≥ 85	0	0	0	0	0	0	452	447

Contour Interval (dB DNL)	Population Affected (Off-Installation/ Airport)		Population Affected (On-Installation/ Airport)		Total Area Affected (Off-Installation/ Airport)		Total Area Affected (On-Installation/ Airport)	
	Number	Change	Number	Change	Acres	Change	Acres	Change
Mitigated Scenario B2 (48 Aircraft)								
Total ≥ 65	**3,956**	**3,814**	**0**	**0**	**6,058**	**5,969**	**3,329**	**2,088**
65–69	2,617	2,486	0	0	4,299	4,217	965	351
70–74	830	819	0	0	1,338	1,331	829	585
75–79	451	451	0	0	376	376	570	292
80–84	58	58	0	0	44	44	370	270
≥ 85	0	0	0	0	1	1	595	590
Mitigated Scenario B3 (72 Aircraft)								
Total ≥ 65	**5,886**	**5,744**	**0**	**0**	**8,804**	**8,715**	**3,770**	**2,529**
65–69	3,785	3,654	0	0	6,042	5,960	1,126	512
70–74	1,391	1,380	0	0	2,062	2,055	856	612
75–79	559	559	0	0	577	577	658	380
80–84	151	151	0	0	118	118	426	326
≥ 85	0	0	0	0	5	5	704	699

Table BO 3.2–3 lists noise levels at several representative noise-sensitive locations under baseline conditions and Scenarios B1, B2, and B3. Representative locations include all on-installation schools, hospitals, and places of worship. Off-installation representative noise-sensitive locations include schools, hospitals, and places of worship that could be found in publicly available databases that lie within the 65 dB DNL noise contour line under any scenario. The locations are referred to as "representative" because the list is not intended to include all facilities that could be considered schools, hospitals, or places of worship. Many facilities accommodate several functions and therefore may not be classified as a school, hospital, or place of worship in publicly available databases. Furthermore, new facilities may open and old facilities may close, making it difficult to establish an all-inclusive list.

Table BO 3.2–3. Noise Levels at Representative Noise-Sensitive Locations, Baseline Conditions and F-35A Beddown Scenarios

ID No.	General Description[1]	Outdoor DNL[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]		Outdoor $L_{eq(SD)}$[2]		Percentage Awakened (windows open)[2]		Percentage Awakened (windows closed)[2]	
Baseline Conditions													
1	Capital City Baptist	53		2		0		51		26		11	
2	Church of JCLDS: Idaho Boise Mission	54		2		0		51		26		11	
3	Church of JCLDS: Vista	50		1		0		48		19		5	
4	Church of the Nazarene: New Hope	58		6		1		55		28		17	
5	Columbia Heights Baptist	53		2		0		52		25		10	
6	Five Mile Community Church	58		6		1		55		28		18	
7	Frank Church High School	49		1		0		48		12		2	
8	Jehovah's Witnesses Kingdom Hall	68		11		4		66		46		31	
9	Korean Evangelical Church	54		3		0		53		28		9	
10	Life Church Boise	58		6		1		55		29		19	
11	Second Baptist Church	54		3		0		51		23		11	
12	SGI USA	55		5		0		54		32		12	
13	Treasure Valley Full Gospel	50		1		0		49		18		2	
14	Hillcrest Elementary	52		2		0		51		25		7	
15	Owyhee Elementary	55		4		0		54		29		14	
16	West Junior High	51		1		0		50		17		3	
17	Boise AGS Chapel	60		7		1		58		35		19	
Scenario B1 (24 Aircraft)													
1	Capital City Baptist	63	(10)	5	(3)	2	(2)	64	(13)	32	(6)	15	(3)
2	Church of JCLDS: Idaho Boise Mission	64	(10)	6	(3)	2	(2)	65	(14)	33	(6)	15	(3)
3	Church of JCLDS: Vista	60	(10)	4	(3)	2	(2)	61	(13)	24	(5)	7	(1)
4	Church of the Nazarene: New Hope	62	(4)	9	(4)	2	(2)	60	(5)	36	(8)	22	(5)
5	Columbia Heights Baptist	63	(10)	5	(3)	2	(2)	65	(13)	31	(6)	14	(3)
6	Five Mile Community Church	62	(4)	9	(4)	2	(2)	60	(5)	36	(8)	23	(5)
7	Frank Church High School	57	(8)	3	(3)	2	(2)	59	(11)	16	(4)	4	(2)
8	Jehovah's Witnesses Kingdom Hall	82	(14)	17	(6)	8	(4)	84	(18)	54	(8)	37	(6)
9	Korean Evangelical Church	65	(11)	7	(3)	3	(3)	66	(13)	36	(7)	14	(5)
10	Life Church Boise	62	(4)	10	(4)	2	(2)	60	(5)	36	(8)	24	(6)
11	Second Baptist Church	59	(5)	5	(3)	1	(0)	56	(5)	30	(7)	15	(4)
12	SGI USA	67	(12)	8	(4)	3	(3)	68	(14)	39	(8)	17	(5)
13	Treasure Valley Full Gospel	58	(8)	4	(3)	2	(2)	59	(10)	24	(6)	4	(2)
14	Hillcrest Elementary	62	(10)	4	(3)	3	(3)	63	(12)	31	(6)	11	(4)
15	Owyhee Elementary	66	(11)	8	(4)	3	(2)	68	(15)	36	(7)	18	(4)
16	West Junior High	59	(8)	4	(3)	2	(2)	61	(11)	22	(5)	5	(2)
17	Boise AGS Chapel	72	(12)	12	(5)	4	(3)	74	(16)	42	(7)	23	(4)

ID No.	General Description[1]	Outdoor DNL[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]		Outdoor $L_{eq(SD)}$[2]		Percentage Awakened (windows open)[2]		Percentage Awakened (windows closed)[2]	
Scenario B2 (48 Aircraft)													
1	Capital City Baptist	65	(12)	7	(5)	3	(3)	67	(16)	29	(3)	13	(2)
2	Church of JCLDS: Idaho Boise Mission	66	(12)	8	(6)	4	(4)	68	(17)	30	(3)	12	(0)
3	Church of JCLDS: Vista	62	(12)	6	(6)	4	(4)	64	(16)	22	(3)	3	(-2)
4	Church of the Nazarene: New Hope	63	(5)	11	(5)	4	(3)	62	(7)	35	(7)	22	(5)
5	Columbia Heights Baptist	66	(13)	7	(5)	3	(3)	68	(16)	28	(3)	12	(2)
6	Five Mile Community Church	64	(6)	11	(5)	4	(3)	61	(7)	35	(7)	23	(5)
7	Frank Church High School	60	(11)	6	(5)	4	(4)	62	(13)	18	(6)	5	(3)
8	Jehovah's Witnesses Kingdom Hall	85	(17)	20	(8)	10	(5)	87	(21)	48	(2)	31	(0)
9	Korean Evangelical Church	67	(13)	9	(5)	5	(5)	69	(16)	32	(4)	12	(2)
10	Life Church Boise	64	(6)	12	(6)	4	(3)	62	(7)	36	(7)	24	(5)
11	Second Baptist Church	61	(7)	7	(5)	1	(1)	59	(7)	30	(6)	14	(4)
12	SGI USA	70	(15)	10	(6)	5	(5)	71	(17)	35	(4)	15	(3)
13	Treasure Valley Full Gospel	61	(11)	6	(5)	4	(4)	62	(13)	23	(5)	5	(3)
14	Hillcrest Elementary	64	(12)	6	(5)	5	(5)	66	(15)	28	(4)	9	(1)
15	Owyhee Elementary	69	(14)	10	(7)	5	(4)	71	(18)	33	(4)	14	(0)
16	West Junior High	62	(11)	6	(5)	4	(4)	64	(14)	22	(5)	6	(3)
17	Boise AGS Chapel	75	(15)	14	(7)	6	(5)	77	(19)	38	(3)	18	(-1)
Scenario B3 (72 Aircraft)													
1	Capital City Baptist	67	(14)	10	(8)	5	(5)	72	(21)	31	(5)	15	(4)
2	Church of JCLDS: Idaho Boise Mission	68	(14)	11	(9)	5	(5)	73	(22)	32	(6)	14	(3)
3	Church of JCLDS: Vista	64	(14)	9	(9)	5	(5)	69	(21)	25	(6)	5	(-1)
4	Church of the Nazarene: New Hope	65	(7)	13	(7)	5	(5)	66	(11)	38	(10)	24	(7)
5	Columbia Heights Baptist	67	(14)	10	(8)	5	(5)	72	(21)	30	(5)	14	(4)
6	Five Mile Community Church	65	(7)	13	(7)	5	(5)	66	(11)	38	(10)	25	(7)
7	Frank Church High School	62	(13)	8	(7)	6	(6)	66	(18)	20	(8)	6	(4)
8	Jehovah's Witnesses Kingdom Hall	86	(18)	23	(11)	12	(8)	91	(25)	51	(4)	32	(2)
9	Korean Evangelical Church	69	(15)	11	(7)	7	(7)	74	(21)	34	(6)	13	(4)
10	Life Church Boise	66	(8)	14	(8)	5	(5)	66	(11)	39	(10)	26	(7)
11	Second Baptist Church	62	(8)	9	(7)	1	(1)	63	(12)	32	(9)	17	(6)
12	SGI USA	71	(16)	13	(8)	7	(7)	76	(22)	37	(6)	16	(4)
13	Treasure Valley Full Gospel	62	(12)	8	(7)	6	(6)	67	(18)	25	(7)	7	(5)
14	Hillcrest Elementary	66	(14)	9	(7)	7	(7)	71	(20)	30	(5)	10	(3)
15	Owyhee Elementary	71	(16)	13	(10)	7	(7)	76	(23)	36	(6)	15	(1)
16	West Junior High	63	(12)	8	(7)	6	(6)	68	(18)	24	(7)	8	(5)
17	Boise AGS Chapel	76	(16)	17	(10)	8	(7)	81	(23)	40	(5)	19	(0)

[1] Locations presented in this table are provided to help understand the noise environment. This list is not meant to be inclusive of all noise-sensitive receptors in the affected environment.
[2] Numbers in parentheses indicate delta relative to baseline conditions.

Descriptions of noise levels at the representative noise-sensitive locations also provide information relevant to surrounding land uses. For this reason, all noise metrics were calculated for all locations studied, even though some metrics are not directly relevant to a specific facility listed. For example, the percentage of persons awakened at least once per night is not directly relevant to a school or place of worship, but is relevant to residential areas, which tend to be located near schools and places of worship.

At the representative noise-sensitive locations studied, the DNL would increase by an amount ranging from 4 to 18 dB under Scenarios B1, B2, and B3. To put these increases in perspective, increases in instantaneous noise levels of 3 to 10 dB are typically described as "noticeable," and increases of more than 10 dB are typically described as "more than twice as loud." Under Scenario B1, the DNL at the Jehovah's Witnesses Kingdom Hall (Location No. 8) would increase from 68 dB DNL to 82 dB DNL, and the DNL at four additional noise-sensitive locations would increase to greater than 65 dB. Under Scenario B2, the DNL at 8 of the 17 locations studied would exceed 65 dB. The DNL at Location No. 8 would be 85 dB, and the DNL at the Boise AGS Chapel (Location No. 17) would be 75 dB. Under Scenario B3, the DNL at all locations studied except Church of JCLDS: Vista (Location No. 3), Frank Church High School (Location No. 7), Second Baptist Church (Location No. 11), Treasure Valley Full Gospel (Location No. 13), and West Junior High (Location No. 16) would exceed 65 dB. The noise level at Location No. 8 would be 86 dB DNL, and the noise level at Location No. 17 would be 76 dB.

Among all of the noise-sensitive locations studied, the cumulative average number of indoor events per daytime hour with windows open exceeding 50 dB L_{max} would increase by 90 percent under Scenario B1, 147 percent under Scenario B2, and 215 percent under Scenario B3. If windows are closed, the average number of noise events per daytime hour exceeding 50 dB L_{max} would increase by approximately a factor of 5, 8, and 12 relative to baseline conditions. Events exceeding 50 dB L_{max} have an increased likelihood of interfering with speech.

Of the four schools analyzed, only Owyhee Elementary (Location No. 15) would experience exterior $L_{eq(SD)}$ exceeding 65 dB under Scenario B1. Under Scenario B2, $L_{eq(SD)}$ would increase to greater than 65 dB at Hillcrest Elementary (Location No. 14) and Location No. 15. Under Scenario B3, the $L_{eq(SD)}$ at all four schools studied would increase to greater than 65 dB. Assuming that a typical school structure provides 25 dB outdoor-to-indoor noise level reduction with windows closed, schools experiencing an outdoor $L_{eq(SD)}$ that exceeds 65 dB may not meet the 2009 American National Standards Institute (ANSI) standard (40 dB in classroom) for at least a portion of 1 hour during a typical school day. F-35A operational schedules are not known at this time. In a hypothetical hour with twice the average daytime number of operations, L_{eq} would be 3 dB higher than the $L_{eq(SD)}$ listed in Table BO 3.2–3. Actual outdoor-to-indoor noise level reduction varies from school to school and between locations within individual schools.

The percentage of persons awakened from sleep by aircraft noise was estimated using the methodology described in Chapter 3, Section 3.2, for "windows open" and "windows closed" conditions. As described in Section BO 2.1.1, F-35A arrivals after 10:00 p.m. are expected to occur during approximately 10 percent of total F-35A sorties under Scenario B3. The percentage of total F-35A sorties returning after 10:00 p.m. would be lower under Scenarios B1 and B2 (9 percent of total). Under Scenario B1, the percentage of persons awakened at the locations

studied would range from 16 to 54 percent with windows open and from 4 to 37 percent with windows closed. The average percentage awakened at all locations studied would increase by 25 percent and 33 percent relative to baseline conditions under windows open and windows closed conditions, respectively. Under Scenario B2, the percentage of persons awakened would be slightly less than that under Scenario B1 because of the relocation of A-10 aircraft from Boise AGS. The average number of persons awakened with windows open would increase by 16 percent and 17 percent relative to baseline conditions under windows open and windows closed conditions, respectively, under Scenario B2. Under Scenario B3, increased late-night operations would result in a 25 percent increase in persons awakened by aircraft noise under windows open conditions. The number of persons awakened would increase by 31 percent relative to baseline conditions under Scenario B3 with windows closed.

F-35A training at active-duty Air Force locations would not be expected to take place on the weekend (i.e., Saturday or Sunday). However, mission requirements would dictate the flying schedule. Other weekend flying and ANG weekend training is expected to continue at its current rate.

The risk of hearing loss under the beddown scenarios was assessed using the methodology described in Chapter 3, Section 3.2, and in greater detail in Appendix B. Under Scenarios B1, B2, and B3, the estimated number of off-installation residents affected by noise levels greater than 80 dB DNL would increase from zero to 68, 164, and 313 persons, respectively (see Table BO 3.2–4). Persons exposed to noise at greater than 80 dB DNL would have an increased likelihood of experiencing noise-induced permanent threshold shift (NIPTS) as shown in Chapter 3, Table 3–2. As an example, under Scenario B1, it is estimated that 12 individuals would reside within the 82–83 dB DNL contour surrounding Boise Air Terminal Airport. If these individuals have an average response to noise, then they may experience as much as a 4 dB NIPTS in hearing were the individuals to remain in that location every day for 8 hours per day for 40 years and be fully exposed to the noise level at their residences (i.e., no time is spent indoors). If the same individuals spend the national average percentage of their total day indoors (87 percent), then the individuals would be expected to experience no more than 1 dB NIPTS in hearing. If the individuals were particularly sensitive, they could experience up to a 9 dB NIPTS if they were fully exposed to noise and up to 3.5 dB NIPTS if they spend the national average percentage of their day indoors. On Boise AGS, the risk of workers' experiencing hearing loss would be managed as per the DoD regulations, and on Boise Air Terminal Airport, the risk of workers' experiencing hearing loss would be managed according to OSHA and NIOSH regulations. Under Scenarios B1, B2, and B3, there would be 43, 73, and 112 structures, respectively, on Boise AGS or Boise Air Terminal Airport affected by noise levels greater than 80 dB DNL.

To support one mission per student pilot involving use of live munitions, up to 108 live mission flights would be carried out each year under Scenario B3. This equates to about two flights per week. Because live munitions are not stored at Boise AGS, pilots would fly to either Mountain Home AFB or to Hill AFB to rearm before flying to the appropriate ranges. F-35A sound levels at a representative altitude and distance are shown in Table BO 3.2-1.

As F-35A noise levels would not exceed 130 dB in any 1/3-octave frequency band at distances of greater than 250 feet, no damage to structures is expected to occur as a result of F-35A subsonic noise (CHABA 1977). The term 'frequency bands' refers to noise energy in a certain range of frequencies and is similar in concept to frequency bands employed on home stereo equalizers to control relative levels of bass and treble. Noise energy in certain frequency bands has increased potential to vibrate and/or damage structures. Furthermore, studies conducted on vibrations induced by subsonic aircraft overflights generating similar noise levels to the F-35A in ancient Anasazi ruins indicate that vibrations would not occur at or near potentially damaging levels. Additional discussion of the effects of noise on cultural resources and ancient fragile structures can be found in Section BO 3.9.

Table BO 3.2–4. Boise AGS Estimated Off-Installation Population Exposed to Noise Levels that Could Result in NIPTS, Baseline Conditions and F-35A Beddown Scenarios

Contour Band (dB DNL)	*Estimated Population*			
	Baseline Conditions	**Scenario B1 (24 Aircraft)**	**Scenario B2 (48 Aircraft)**	**Scenario B3 (72 Aircraft)**
80–81	0	27	41	93
81–82	0	16	30	68
82–83	0	12	31	36
83–84	0	9	25	30
84–85	0	4	15	31
85–86	0	–	11	21
86–87	0	–	9	14
87–88	0	–	2	11
88–89	0	–	–	8
89–90	0	–	–	1
90–91	0	–	–	–
Total	**0**	**68**	**164**	**313**

Indirect impacts of noise on land use patterns could potentially occur, although it is impossible to predict exactly what form the impact would take. As discussed in detail in Section BO 3.10, implementation of certain scenarios would result in existing land uses becoming incompatible with noise due to the increase in noise level.

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include non-auditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines. More-specific discussions on noise effects on animal species can be found in Sections BO 3.6, BO 3.7, and BO 3.8.

Many factors affect the market value of real property. While qualities of the property itself, surrounding properties, and the local real estate market are clearly the primary determinants of value, ambient noise levels could also play a role in determining market value. The effect of ambient noise level on real property market value has been studied extensively, but results have been contradictory. More-specific discussions on the effect of noise on real property market value can be found in Section BO 3.11.

Any claims from Air Force–related damage would begin by contacting the Boise AGS Public Affairs Office with details of the claim. The Air Force would then investigate to establish the exact nature and extent of any damage.

BO 3.2.2 Airspace

BO 3.2.2.1 Airspace Affected Environment

Within MOAs, ATCAAs, and Restricted Areas, training flights are typically widely dispersed and random. Flight operations are constrained only by the boundaries of the airspace and any restrictions on training in the form of designated avoidance areas. The Air Force has developed the MOA-Range NOISEMAP (MR_NMAP) program to calculate subsonic aircraft noise in these areas (Lucas and Calamia 1996). MR_NMAP can also calculate noise levels beneath MTRs where flight paths are restricted to a designated corridor. Subsonic aircraft noise levels associated with operations in the primary use airspace were calculated using MR_NMAP and are shown in Table BO 3.2–5. Noise was not explicitly computed for occasional use airspace because of the low amount of use. The number of operations conducted in these occasional use airspace units is so low that their influence on the cumulative noise is negligible. All of the MOAs, Restricted Areas, and MTRs experience noise levels below 65 dB DNL_{mr} under baseline conditions except for the centerline of Instrument Route (IR)-302/305, which experiences 65 dB DNL_{mr} under baseline conditions.

Each MTR includes several segments with defined beginning and ending locations, as well as a defined route corridor width to the right and to the left of the centerline. Studies of MTR operations show that operations are concentrated near the MTR centerline and spend relatively less time near the route corridor edges (Lucas and Plotkin 1988). MTR noise levels stated in this EIS are for a location beneath the MTR centerline in the narrowest segment of the MTR (i.e., the point of highest concentration of overflights). Pilots often enter and exit MTRs at points along the route rather than at the beginning and end points, such that certain MTR segments may experience fewer annual sortie operations than indicated in Table BO 2.2–2.

Military aircraft are not the only source of sound under the airspace. Aircraft noise must be compared with background or "ambient" noise, as well as evaluated on an absolute basis. Ambient noise levels in a quiet residential setting are approximately 45 dB DNL (EPA 1974). The vast majority of the airspace ROI consists of rural areas in which noise levels would be below 45 dB DNL. In those areas where military aircraft noise levels would be less than 45 dB DNL_{mr}, military aircraft noise could be noticed but would not add appreciably to overall noise levels. Noise levels in such airspace units are simply listed in Table BO 3.2–5 as "< 45."

Table BO 3.2–5. Noise Environment for Boise AGS Primary Use Airspace, Baseline Conditions and F-35A Scenarios

F-35A Primary Use Airspace	*Baseline Noise Level*			*Scenario B1 (24 Aircraft)*			*Scenario B2 (48 Aircraft)*			*Scenario B3 (72 Aircraft)*		
	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day
Jarbidge North MOA/ATCAA	64	53	2.0	65	54	2.1	66	54	2.2	67	54	2.4
Jarbidge South MOA/ATCAA	< 45	48	0.6	< 45	48	0.6	< 45	48	0.6	< 45	48	0.6
Owyhee South MOA/ATCAA	< 45	48	0.6	< 45	48	0.6	< 45	48	0.6	< 45	48	0.6
Paradise North/South MOA/ATCAA	< 45	48	0.6	< 45	48	0.6	< 45	48	0.6	< 45	48	0.6
Owyhee North MOA/ATCAA	64	57	1.9	65	57	2	65	57	2.1	66	57	2.2
Saddle A/B MOAs/ATCAAs	< 45	N/A	N/A	49	N/A	N/A	51	N/A	N/A	53	N/A	N/A
R-3202 (Saylor Creek Range	64	53	2.0	65	54	2.1	66	54	2.2	67	54	2.4
R-3204A/B (Juniper Butte Range)	64	53	2.0	65	54	2.1	66	54	2.2	67	54	2.4
IR-301/307	64	N/A	N/A	66	N/A	N/A	66	N/A	N/A	67	N/A	N/A
IR-302/305	65	N/A	N/A	66	N/A	N/A	67	N/A	N/A	68	N/A	N/A
VR-316/319	53	N/A	N/A	55	N/A	N/A	57	N/A	N/A	58	N/A	N/A
VR-1302	< 45	N/A	N/A	< 45	N/A	N/A	46	N/A	N/A	48	N/A	N/A

Note: Jarbidge South, Owyhee South, and Paradise North/South MOAs and ATCAAs would be scheduled and used as a single airspace complex; therefore, the noise levels for these airspace units is generally the same. Jarbidge North MOA, R-3202, and R-3204 are used in conjunction with one another; therefore, their noise levels are generally the same.

Sonic boom noise levels were calculated using the BOOMAP program. Under baseline conditions, sonic boom noise levels do not exceed 62 CDNL under any primary use airspace unit. The Jarbidge North/South MOAs, R-3202, and R-3204A/B experience the greatest number of sonic booms per day of the primary use airspace units, with 2.0 sonic booms per average day at any given location near the center of the airspace unit. Owyhee North MOA experiences slightly less booms, at 1.9 per day on average. Supersonic flight is not authorized on MTRs or in the Saddle A or B MOAs.

BO 3.2.2.2 Airspace Environmental Consequences

The projected F-35A training operations would increase subsonic noise levels beneath the primary use airspace units by between 1 and 8 dB (see Table BO 3.2–5). To put these increases in perspective, increases in instantaneous noise levels of 3 to 10 dB are typically described as "noticeable," and increases of greater than 10 dB are typically described as "more than twice as loud." The F-35A is substantially louder than the A-10 aircraft currently based at Boise AGS (see Table BO 3.2–6) and is more comparable to the F-15 aircraft that currently use the airspace at Mountain Home AFB. However, the F-35A also uses higher altitudes for training more frequently than the A-10 (see Table BO 2.2–3). Approximately 7, 7, and 8 percent of total F-35A sortie-operations would be conducted during "environmental night" (10:00 p.m. to 7:00 a.m.) under Scenarios B1, B2, and B3, respectively. Areas beneath the Jarbidge North MOA/ATCAA,

R-3202, and R-3204A/B would experience noise levels of 65 dB DNL_{mr}, 66 dB DNL_{mr}, and 67 dB DNL_{mr} under Scenarios B1, B2, and B3, respectively. Owyhee North MOA/ATCAA would experience 65 dB DNL_{mr} under Scenarios B1 and B2, and 66 dB DNL_{mr} under Scenario B3. Noise levels beneath all other primary use MOAs and Restricted Area airspace would remain below 65 dB DNL_{mr} under all scenarios. Beneath the centerlines of MTRs IR-301/307, noise levels would increase from approximately 64 dB DNL_{mr} under baseline conditions to 66 dB DNL_{mr} under Scenarios B1 and B2 and to 67 dB DNL_{mr} under Scenario B3. Noise levels beneath IR-302/305 would increase from 65 dB DNL_{mr} under baseline conditions to 66 dB DNL_{mr} under Scenario B1, 67 dB DNL_{mr} under Scenario B2, and 68 dB DNL_{mr} under Scenario B3. Beneath the centerlines of Visual Route (VR)-316/319, DNL_{mr} would increase from 53 dB under baseline conditions to 55 dB under Scenario B1, 57 dB under Scenario B2, and 58 dB under Scenario B3. Subsonic noise levels beneath the centerline of VR-1302 would remain below 45 dB DNL_{mr} under Scenario B1, but would increase slightly to 46 dB and 48 dB under Scenarios B2 and B3, respectively. Areas within the MTR corridor, but not directly beneath the MTR centerline, would experience fewer overflights and less noise than areas directly beneath the centerline. Noise levels generated by overflight of F-35A aircraft and several other aircraft that use the training airspace frequently are shown in Table BO 3.2–6. For each aircraft type, the table shows SEL and, in parentheses, the SEL_r metric, which adds a decibel 'penalty' to events with fast onset rates that have an increased potential to surprise people.

Table BO 3.2–6. Comparative Aircraft SEL_r Under the Flight Track for Aircraft at Various Vertical Distances (Feet AGL) in Training Airspace

	SEL (SEL_r) in dB						
Aircraft	**500 AGL**	**1,000 AGL**	**2,000 AGL**	**5,000 AGL**	**10,000 AGL**	***Power***	***Speed (knots)***
A-10	97 (97)	91 (91)	83 (83)	67 (67)	55 (55)	5333 NF	325
F-35A[1]	127 (128)	120 (120)	112 (112)	102 (102)	94 (94)	95% ETR	475
F-16[2]	116 (118)	111 (111)	104 (104)	94 (94)	86 (86)	104% NC	350
F-15	116 (121)	110 (111)	104 (104)	95 (95)	85 (85)	82% NC	550
F/A-18 E/F	116 (119)	111 (111)	105 (105)	95 (95)	86 (86)	83% N2	350
F-4C	114 (119)	109 (110)	103 (103)	93 (93)	83 (83)	98% RPM	550

[1] The noise levels for the F-35A operating at high speeds were based on an empirical curve fit from the noise data contained in NoiseFile database for these high-speed operations (Wyle 2010).
[2] The F-16 engine is GE-100.
Note: Level flight, steady high-speed conditions. Used standard acoustical conditions (59 degrees Fahrenheit and 70 percent relative humidity).
Key: ETR=engine thrust request; N2=engine speed at position 2; NC=core engine speed; NF=fan speed.

Under baseline conditions and beddown scenarios, aircraft sometimes fly in groups known as "formations." Since SEL is an exposure-based metric, doubling the number of aircraft flying overhead results in a combined SEL that is 3 dB higher than the individual overflights. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL as listed in Table BO 3.2–6.

Most F-35A training time is spent at high altitudes, with approximately 93 percent of total training time occurring above 5,000 AGL (see Chapter 2, Table 2–9). However, when conducting low-altitude training at high engine power settings, F-35A aircraft overflights generate noise levels exceeding 115 dB SEL. As discussed in Appendix B, Section B.2.5.1, studies suggest that individual noise events in excess of 115 dB can trigger a temporary shift in hearing threshold, although the findings of the studies conflict as to the extent of the shift and whether the shift is to an increased or decreased hearing sensitivity (Ising et al. 1999; West and Green 1994).

Test flight data recorded during multiple low-altitude training flight simulator runs were used to estimate the average number of times per month that a location under the MTR centerline would be exposed to noise levels exceeding 115 dB. From the simulator data, it was found that 80 percent of the total time spent on an MTR was spent at aircraft engine power settings of 50 percent ETR or below, with the remainder of the time spent at higher engine power settings. Approximately 70 percent of total time was spent at altitudes between 500 and 750 feet AGL, with the remaining time being spent at altitudes between 750 and 1,500 feet AGL. A probability-based model, which is described in Appendix B, Section B.3, was used to combine data collected from flight simulator runs with expected MTR frequency of use data. On the narrowest segment of the most frequently used MTR under the scenario with the highest number of MTR sortie-operations (i.e., Scenario B3), an average of 9 overflights per year would exceed 115 dB at a particular point underneath the centerline of the MTR. The average frequency of noise levels exceeding 120 dB (the lower threshold for ear discomfort) would be substantially less. Low-altitude noise events are very brief, with the high noise levels typically lasting less than 4 seconds. NIPTS, otherwise known as hearing loss, typically occurs when loud events are repeated frequently such as occurs in a workplace environment. Infrequent loud events, such as the events that would occur with proposed F-35A low-altitude training, could be highly annoying, but would not be expected to result in NIPTS.

F-35A training at active-duty Air Force locations would not be expected to take place on the weekend (i.e., Saturday or Sunday). However, mission requirements would dictate the flying schedule. Other weekend flying and ANG weekend training is expected to continue at its current rate.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training. The amplitude of an individual sonic boom is measured by its peak overpressure, in pounds per square foot, and depends on an aircraft's size, weight, geometry, Mach number, and flight altitude. Table BO 3.2–7 shows sonic boom peak overpressures for direct overflight of F-16C, F-15E, and F-35A aircraft at Mach 1.2 in straight and level flight at various altitudes as estimated using the program CABOOM (Carlson 1978).

Table BO 3.2–7. Sonic Boom Peak Overpressures (pounds per square foot) for Direct Overflight of F-16, F-15, and F-35A Aircraft at Mach 1.2 Level Flight

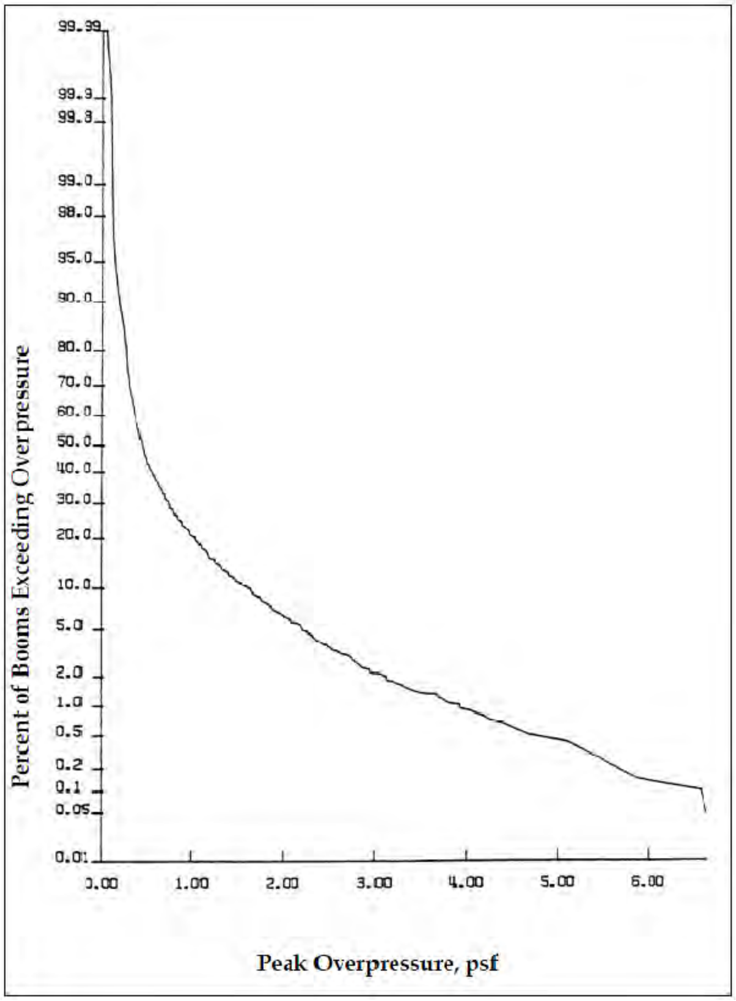
Aircraft	*Altitude (feet AGL)*		
	10,000	**20,000**	**30,000**
F-16C	4.9	2.5	1.6
F-15E	6.4	3.3	2.2
F-35A	5.4	2.9	1.9

Note: Overpressures presented reflect straight and level flight at constant speed; aircraft maneuvers may generate localized "focus booms" with overpressures of 2 to 5 times the magnitude of the steady state sonic booms (Plotkin 1990).
Source: CABOOM (Carlson 1978).

Sonic boom overpressures decrease as the lateral distance from the aircraft flight path increases. Maneuvers can also affect boom amplitude, increasing or decreasing overpressures relative to those shown in Table BO 3.2–7. F-16 aircraft have recently relocated from Mountain Home AFB, and the number of F-16 operations in the training airspace has been drastically reduced relative to historic levels.

Research conducted using the ray acoustic theory computer model PCBOOM indicates that fighter aircraft sonic boom focus factors are generally in the range of 2–3 times that generated by steady state flight, while larger supersonic aircraft may generate focus booms up to 5 times more intense than booms generated by steady state flight (Plotkin 1990).

Focus booms affect very limited ground areas such that the frequency of occurrence of high-intensity focus booms is relatively low. A measurement program was conducted to record the occurrence and intensity of sonic booms near the center of a supersonic training airspace unit (Plotkin et al. 1990). Simultaneous with the sonic boom measurements, recordings were made of air combat maneuvers conducted by the F-15 aircraft that were generating the sonic booms. Figure BO 3.2–4 shows the relative occurrence of overpressures of various intensities recorded during air combat maneuvers, including focus booms. F-35A supersonic training is expected to be similar to F-15 and F-16 supersonic training in terms of the time spent at supersonic speeds per sortie, the types of maneuvers conducted, and the Mach numbers used during training. Therefore, the relative occurrence of the intense sonic booms would be expected to be similar to those shown in Figure BO 3.2–4. On average, at a given location near the center of a training airspace unit, approximately 1 percent of the sonic booms experienced would be expected to exceed 4 psf and approximately 0.2 percent would be expected to exceed 6 psf based on the results of the study. Because the F-35A is expected to conduct supersonic maneuvers that would be similar to those conducted by F-15 and F-16 aircraft, the relative occurrence of the intense sonic booms would be expected to be similar to those recordings.



Source: Plotkin et al. 1990.

Figure BO 3.2–4. Cumulative Distribution of Peak Overpressures

F-35A supersonic training is expected to be similar to the F-16 training that was conducted until recently in the primary use airspace in terms of the time spent at supersonic speeds per sortie, the types of maneuvers conducted, and the Mach numbers used during training. Sonic booms generated by F-35A aircraft would be more intense than sonic booms generated by F-16C aircraft, but not as intense as sonic booms generated by the F-15E aircraft during equivalent flight profiles. While the intensity of sonic booms generated by F-35A aircraft would typically be less than the intensity of booms generated by F-15E aircraft currently, the overall total number of booms would increase due to additional supersonic aircraft sortie-operations being introduced. Table BO 3.2–5 lists the number of booms expected to occur per day and the CDNL in any given location near the center of each primary use airspace unit in which supersonic flight is authorized under baseline conditions and Scenarios B1, B2, and B3. The number of sonic booms and CDNL would decrease in areas located away from the center of the airspace. The CDNL would remain below 62 dB beneath all primary use airspace under all scenarios. The CDNL would increase by 1 dB relative to baseline conditions under Scenarios B1, B2, and B3 beneath the Jarbidge North MOA/ATCAA, R-3202, and R-3204A/B.

Beneath all other airspace units, CDNL would change by less than 1 dB under all scenarios. To put these increases in perspective, increases in instantaneous noise levels of less than 3 dB are typically not noticeable to persons with normal hearing in non-laboratory settings. Beneath the Jarbidge North MOA/ATCAA, R-3202, and R-3204A/B, the average number of sonic booms per day at any given location beneath the airspace units would increase from an average of 2.0 per day under baseline conditions to 2.1 per day under Scenario B1, 2.2 under Scenario B2, and 2.4 under Scenario B3. Beneath the Owyhee North MOA/ATCAA, the number of sonic booms per average day at any given location would increase from 1.9 per day under baseline conditions to 2.0 per day under Scenario B1, 2.1 per day under Scenario B2, and 2.2 per day under Scenario B3. Beneath all other primary training airspace units, the number of booms per day would remain the same (0.6 booms per day) under baseline conditions and all scenarios. Supersonic flight is not authorized in the Saddle MOAs or on MTRs. Increases in the DNL_{mr}, CDNL, and sonic booms are expected to result in additional annoyance in affected persons. If a person feels that his or her property has been damaged by sonic booms caused by aircraft based at Boise AGS, he or she should contact the Boise AGS Public Affairs Office to initiate a claim. As stated in Section BO 3.2.1, F-35A subsonic noise is not expected to cause damage to structures. Additional discussions on the risk of damage to structures caused by subsonic aircraft noise can be found in Section BO 3.9, Cultural Resources.

As described in Section BO 2.2.2, F-35A aircraft would conduct training with inert bombs and 25-millimeter rounds at Saylor Creek and Juniper Butte Ranges. Training with live munitions would be conducted at other ranges. Inert bombs generate minimal noise. Firing of 25-millimeter rounds from F-35A aircraft would generate noise levels similar to those generated by firing of 30-millimeter rounds by A-10 aircraft currently based at Boise AGS.

An estimated 36, 72, and 108 live GBU-12 bombs would be dropped annually by F-35A aircraft at ranges at which live munitions use is authorized under Scenarios B1, B2, and B3, respectively. The UTTR is the range most commonly used by the A-10 aircraft currently based at Boise AGS for live munitions training and would likely be used for the majority of F-35A live munitions training as well. UTTR is used heavily for training with a wide variety of live munitions, including the munitions types proposed to be used by the F-35A. In 2005, total munitions detonated at UTTR were equivalent to approximately 1.3 million pounds of TNT [trinitrotoluene] (Clausen et al. 2007). If all F-35A live munitions training were conducted at UTTR, the total TNT-equivalent under Scenario B3 would be approximately 26,000 pounds, or less than 2 percent of total TNT-equivalent detonated annually under baseline conditions. Increases in munitions noise levels associated with proposed F-35A munitions usage would not be expected to be noticeable in the context of ongoing munitions testing and training at UTTR.

Auxiliary Airfield

Mountain Home AFB. Under Scenarios B1, B2, and B3, the runways at Mountain Home AFB would be used for practice approaches by F-35A aircraft based at Boise AGS. Noise contours at Mountain Home AFB under Scenarios B1, B2, and B3 are shown in Figures BO 3.2–5, BO 3.2–6, and BO 3.2–7, respectively, overlaid on baseline noise contours. The off-installation area affected by noise levels greater than 65 dB DNL would increase by approximately 635 acres, 1,277 acres, and 1,944 acres under Scenarios B1, B2, and B3, respectively (see Table BO 3.2–8). The estimated number of off-installation residents affected under Scenarios B1, B2, and B3 would increase from 10 to 11, 12, and 12, respectively. Numbers of persons exposed to noise at or greater than 65 dB DNL were estimated based on prorating population in 2010 census block according to the proportional area within the noise contour interval. This method is subject to error in sparsely inhabited areas. Persons newly exposed to noise levels exceeding 65 dB DNL may experience increased annoyance and activity interference.

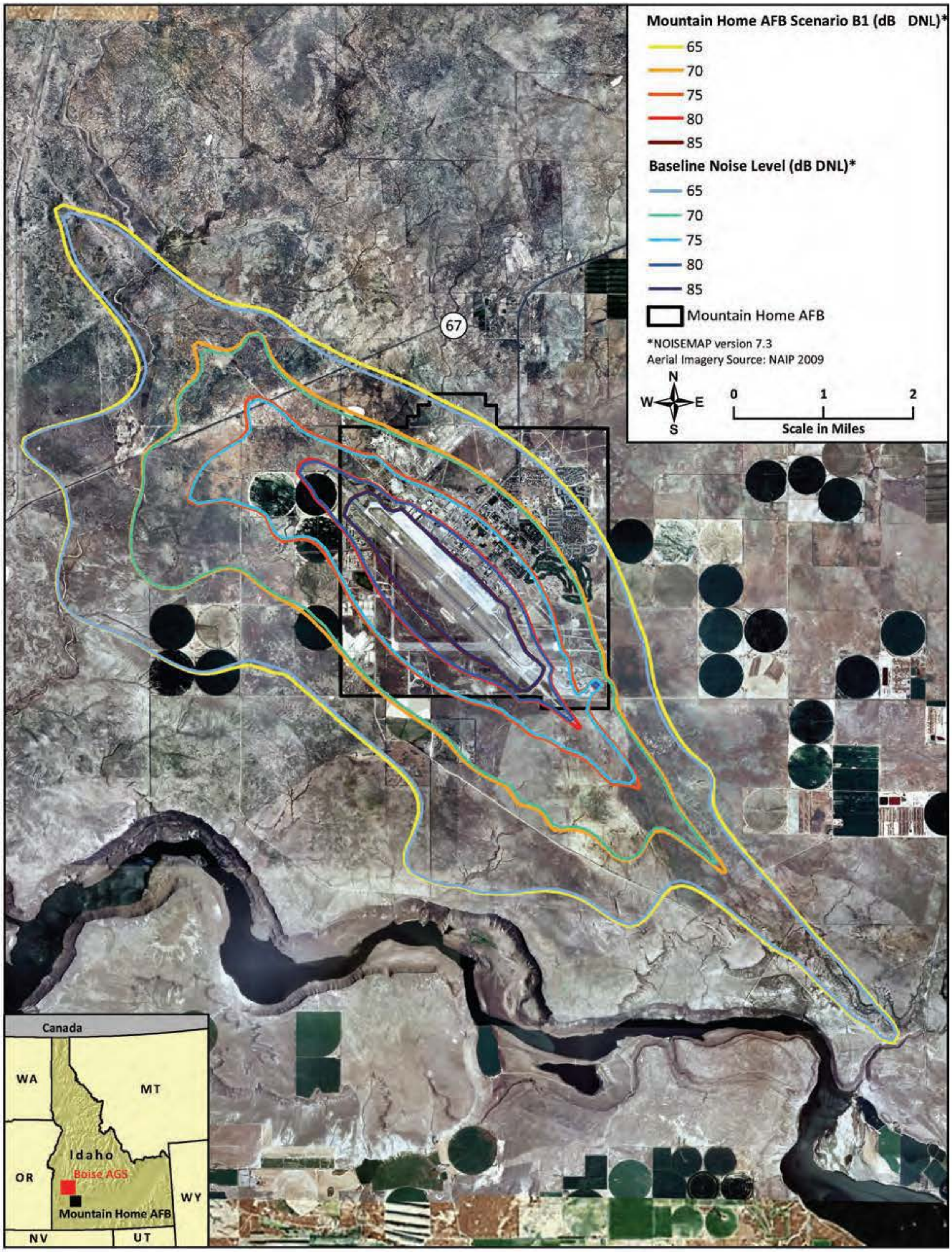


Figure BO 3.2–5. Scenario B1 and Baseline Noise Contours at Mountain Home AFB

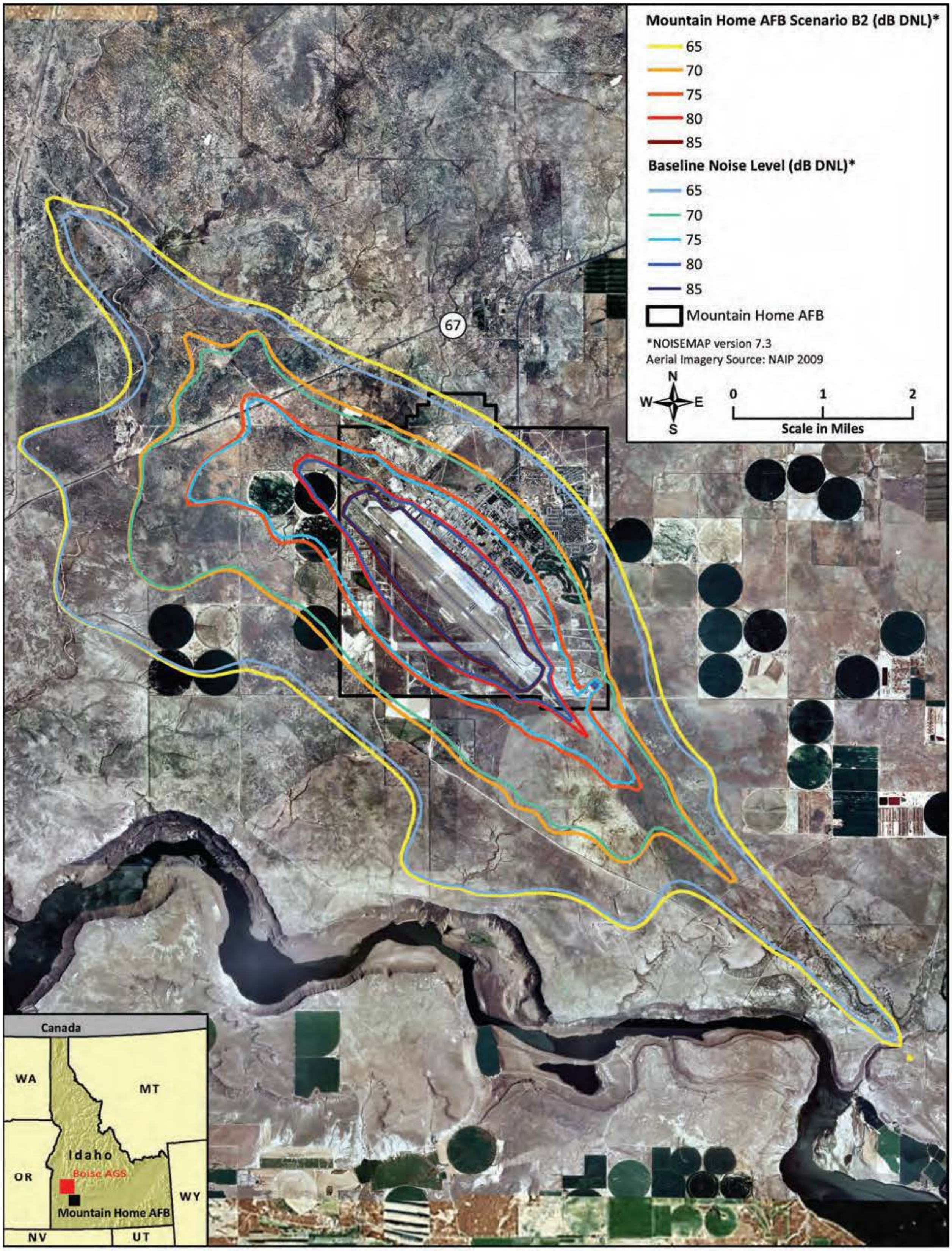


Figure BO 3.2–6. Scenario B2 and Baseline Noise Contours at Mountain Home AFB

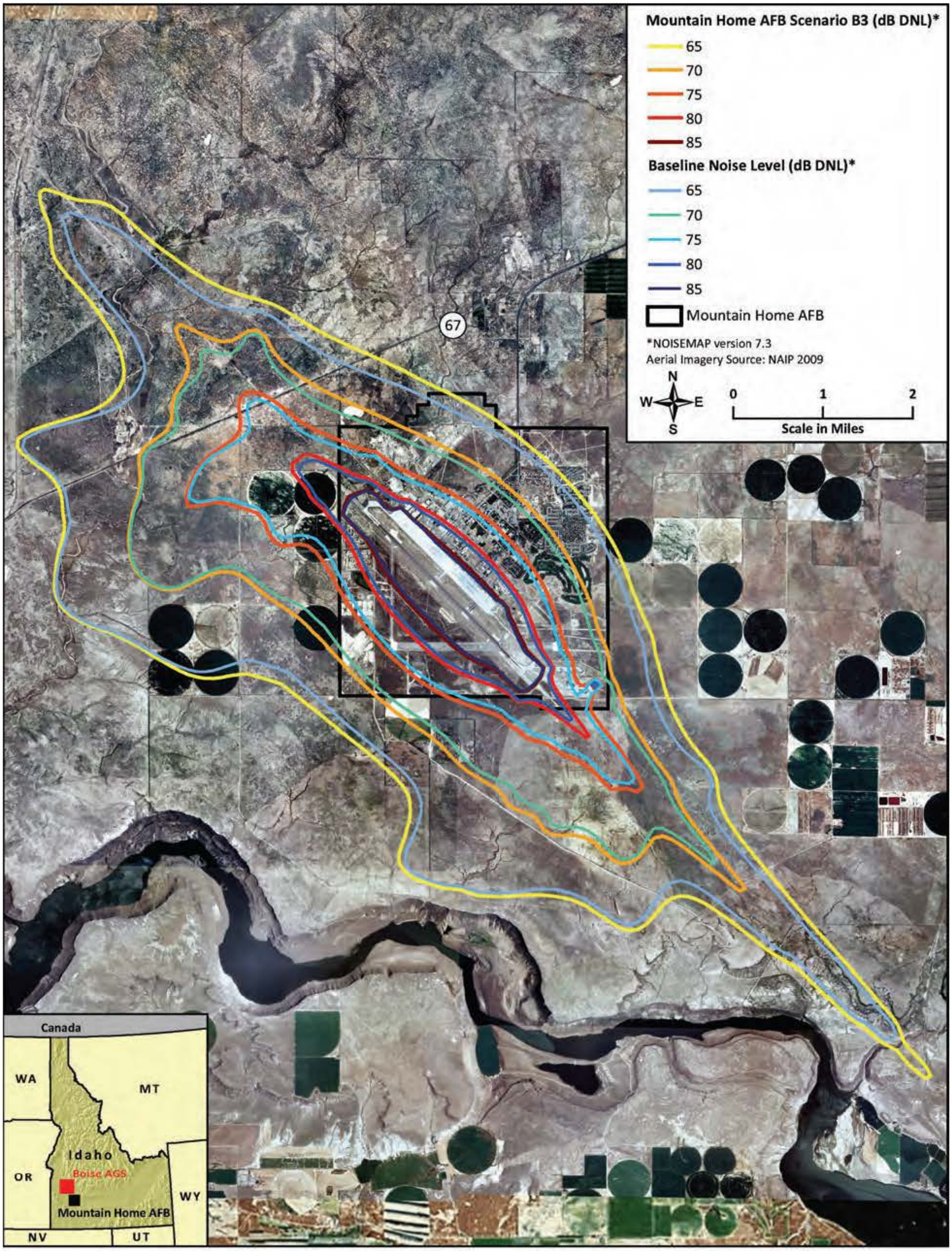


Figure BO 3.2–7. Scenario B3 and Baseline Noise Contours at Mountain Home AFB

Table BO 3.2–8. Population and Acreage Under Noise Contours Near Mountain Home AFB, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation/Airport)*		*Total Area Affected (Off-Installation/Airport)*	
	Number	**Change**	**Acres**	**Change**
Baseline Conditions				
Total ≥ 65	**10**	**N/A**	**13,658**	**N/A**
65–69	4	N/A	8,414	N/A
70–74	1	N/A	3,844	N/A
75–79	5	N/A	1,276	N/A
80–84	0	N/A	124	N/A
≥ 85	0	N/A	0	N/A
Scenario B1 (24 Aircraft)				
Total ≥ 65	**11**	**1**	**14,293**	**635**
65–69	4	0	8,775	361
70–74	1	0	4,001	157
75–79	6	1	1,367	91
80–84	0	0	150	26
≥ 85	0	0	0	0
Scenario B2 (48 Aircraft)				
Total ≥ 65	**12**	**2**	**14,935**	**1,277**
65–69	5	1	9,145	731
70–74	1	0	4,163	319
75–79	6	1	1,453	177
80–84	0	0	174	50
≥ 85	0	0	0	0
Scenario B3 (72 Aircraft)				
Total ≥ 65	**12**	**2**	**15,602**	**1,944**
65–69	5	1	9,540	1,126
70–74	1	0	4,325	481
75–79	6	1	1,539	263
80–84	0	0	198	74
≥ 85	0	0	0	0

No persons reside within the off-installation area affected by greater than 80 dB DNL under any scenario, and hearing loss risk would be minimal. Note that, in areas where population is sparse, such as the area in the vicinity of Mountain Home AFB, the population is unevenly distributed, making estimates of population in a certain area (i.e., within a noise contour interval) particularly prone to error. Population estimates in Table BO 3.2–8 are based on 2010 census demographics data, calculated by proportioning census block populations by the area encompassed within each noise interval. Potential hearing loss risk among DoD employees on Mountain Home AFB would be evaluated using the appropriate DoD component regulations for occupational noise exposure.

BO 3.3 Air Quality

BO 3.3.1 Base

BO 3.3.1.1 Base Affected Environment

Air quality at a given location can be described by the concentrations of various air pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing its concentration to an appropriate Federal and/or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The U.S. Environmental Protection Agency (EPA) established the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. Units of concentration for these standards are generally expressed in parts per million or micrograms per cubic meter. The Idaho Department of Environmental Quality (IDEQ) has adopted standards that are the same as the NAAQS. Table 3–3 in Chapter 3, Section 3.3, presents the NAAQS.

Region of Influence

Air emissions produced from construction and operation of the beddown of F-35A aircraft at Boise AGS would mainly affect air quality within Ada County. Potential aircraft operations would also affect air quality within training areas associated with Boise AGS and aircraft flight routes between these locations. Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as CO and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as O_3 may extend much farther downwind than for inert pollutants. O_3 is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. O_3 precursors are mainly nitrogen oxides (NO_X) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O_3 levels usually occurs several hours after they are emitted and many miles from their source.

Existing Air Quality

The EPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area generally is in nonattainment for a pollutant if the applicable NAAQS has been exceeded more than once per year. Former nonattainment areas that have attained the NAAQS are designated as maintenance areas. Currently, the Boise AGS region within Ada County is in attainment of the NAAQS for all pollutants. However, air monitoring data show that O_3 levels in the Boise AGS region approach the limit for the Federal 8-hour O_3 standard (0.075 parts per million) (AQD 2010a).

In the past, northern Ada County did not attain the NAAQS for CO and PM_{10}. Due to a reduction in emissions caused by Federal emission standards for new vehicles and a state

vehicle emissions testing program, the region has attained the CO standards since December 31, 1995. However, northern Ada County was never classified under Section 186 of the Clean Air Act; therefore, the area is known as a "not-classified" CO nonattainment area. On October 27, 2003, the EPA approved the northern Ada County PM_{10} maintenance plan, and the region is therefore considered a maintenance area for PM_{10}.

Regional Air Emissions. Boise AGS is located in Ada County. Table BO 3.3–1 summarizes the 2008 annual emissions estimated for this region (EPA 2011). The majority of emissions within the region occur from (1) on-road and nonroad mobile sources (VOCs, CO, and NO_X), (2) solvent/surface coating usages (VOCs), and (3) fugitive dust (PM_{10}/$PM_{2.5}$).

Table BO 3.3–1. Annual Emissions for Ada County, Idaho, Calendar Year 2008

	Air Pollutant Emissions (tons per year)					
Source Type	**VOCs**	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Stationary Sources	10,408	20,050	4,779	10,338	20,115	3,464
Mobile Sources	6,904	71,998	9,343	107	529	382
Total	**17,312**	**92,048**	**14,122**	**10,445**	**20,644**	**3,846**

Source: EPA 2011.

Boise AGS Emissions. Table BO 3.3–2 presents an estimation of annual operational emissions associated with the basing of A-10 aircraft at Boise AGS during the base case year of 2009. Existing sources that would be affected by the beddown of F-35A at Boise AGS include (1) operations and engine maintenance/testing of A-10 aircraft, (2) onsite personally and government-owned vehicles (POVs and GOVs), (3) offsite POV commutes, (4) aerospace ground equipment (AGE), (5) nonroad mobile equipment, and (6) stationary and other sources. Emissions associated with existing A-10 aircraft operations were obtained from the *Final 2009 Air Emissions Inventory Report 124 FW Idaho ANG - Boise, Idaho* (Idaho ANG 2010). In addition, emissions from offsite staff commuter vehicles were estimated with the use of average one-way trip lengths (10.2 miles) developed from survey data presented in the *2002 Treasure Valley Transportation Survey Final Report* (CPASI 2003) and the EPA MOBILE6.2 model input files developed for the Boise region by IDEQ's Air Quality Division (AQD 2010b).

Table BO 3.3–2. Annual Emissions from A-10 Operations at Boise AGS, Year 2009 Base Case

	Air Pollutant Emissions (tons per year)						
Activity	**VOCs**	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
A-10 Aircraft Operations	12.84	61.19	2.88	0.46	0.51	0.51	2,766
Onsite POVs and GOVs	0.24	2.17	0.66	0.05	0.02	0.01	191
Offsite POVs	1.86	40.00	1.98	0.03	0.09	0.09	1,423
AGE	0.14	0.34	2.54	0.14	0.13	0.12	65
Nonroad Vehicles	0.27	1.61	3.69	0.08	0.25	0.24	389
Stationary Sources	3.27	1.16	1.02	0.01	0.49	0.45	970
Total Existing Emissions	**18.62**	**106.47**	**12.77**	**0.77**	**1.49**	**1.42**	**5,804**

Key: CO_{2e}=carbon dioxide equivalent.
Source: Idaho ANG 2010, except for offsite POVs, whose emissions were estimated from data provided in CPASI 2003 and AQD 2010b.

Regional Climate

Meteorological data collected in the city of Boise are used to describe the climate of the Boise AGS project area (WRCC 2007a, 2007b, 2010).

Temperature. Ada County is known for mild heat in the summer months and cold conditions during the winter. Temperatures vary greatly between seasons. The average maximum temperatures in January and July are 37.0 degrees Fahrenheit (°F) and 90.8 °F, respectively. Diurnal temperature variations are greatest in the summer, with a 32 °F difference between the average high and low temperature in July. There is only a 14 °F difference in December and January (WRCC 2010).

Precipitation. Average annual precipitation for Boise AGS is 11.71 inches. More precipitation falls in the winter months, with a peak monthly average of 1.44 inches in December. Summers are dry, with the lowest monthly average of 0.27 inches occurring in July. Snow is not uncommon from late fall through early spring. The average annual snowfall in Boise is 19.5 inches, with a peak monthly average of 6.3 inches in January (WRCC 2010).

Prevailing Winds. The annual average wind speed at Boise AGS is 8.0 miles per hour. March and April experience the strongest winds, with a monthly average speed of 8.9 miles per hour during this period. The prevailing wind direction is from the southeast in the fall and winter and from the northwest in the spring and summer (WRCC 2007c).

Applicable Regulations and Standards

Federal Regulations. Because the project region within Ada County includes maintenance areas for the Federal CO and PM_{10} standards, the requirements of the EPA General Conformity Rule are applicable to CO and PM_{10} emissions that would occur from the beddown of F-35A at Boise AGS within these areas. The applicable conformity *de minimis* thresholds for these areas are 100 tons per year of CO and PM_{10}. If emissions from the F-35A beddown scenarios exceed one of these conformity thresholds, the Air Force must demonstrate that these emissions would conform to the State Implementation Plan through application of one or more of the criteria for determining conformity of general Federal actions prescribed in Title 40 of the *Code of Federal Regulations* (CFR), Section 93.158, under the procedures prescribed in 40 CFR, Section 93.159.

State Regulations. IDEQ enforces the NAAQS by developing rules to regulate and permit stationary sources of air emissions. The Idaho air quality regulations are found in *Idaho Administrative Code* 58, Title 1, Chapter 1, "Rules for the Control of Air Pollution in Idaho" (IDAPA 58.01.01) (AQD 2010c).

As part of the attainment planning processes in Ada County, IDEQ has developed the *Northern Ada County CO Maintenance Plan* (IDEQ 2001) and the *Northern Ada County PM_{10} Maintenance Plan* (IDEQ 2002). The emission control strategies developed by these plans include (1) an automotive inspection and maintenance program, (2) a motor vehicle control ordinance, (3) a wood burning ordinance and burning ban enforcement procedures, and (4) a wood smoke control ordinance.

Several states have promulgated laws as a means of reducing statewide levels of greenhouse gas (GHG) emissions. Groups of states, such as the Western Climate Initiative (of which Idaho is an observing member), have formed regionally based collectives to jointly address GHG pollutants. In addition, as part of State of Idaho Executive Order 2007-05 (Idaho 2007), the IDEQ has completed a statewide inventory of existing and future GHG emissions and is working with state agencies to implement GHG reduction strategies.

BO 3.3.1.2 Base Environmental Consequences

Air quality impacts from the F-35A beddown at Boise AGS were reviewed in light of Federal and state air pollution standards and regulations. For the purposes of this analysis, if project emissions exceeded a threshold requiring a conformity determination in the Ada County project region (e.g., 100 tons per year of CO or PM_{10}), further analysis was conducted to determine whether impacts would be significant. In such cases, if emissions conform to the approved State Implementation Plan, impacts would be less than significant. In the case of criteria pollutants for which the Ada County project region is in attainment of an NAAQS (O_3, NO_2, SO_2, and $PM_{2.5}$), the analysis used the Prevention of Significant Deterioration (PSD) threshold for new major sources of 250 tons per year as an indicator of significance or nonsignificance of projected air quality impacts.

Construction

The beddown of F-35A aircraft at Boise AGS would require construction and/or renovation of airfield facilities to accommodate the basing decision, including training facilities, hangars, taxiways, and maintenance and fueling facilities. Air quality impacts from projected construction activities would result from (1) combustive emissions due to the use of fossil-fuel-powered equipment and (2) fugitive dust emissions (PM_{10}/$PM_{2.5}$) due to the operation of equipment on exposed soil. Construction activity data developed by Air Force staff were used to estimate projected construction equipment usages and associated combustive and fugitive dust emissions (Air Force 2010b).

Factors needed to derive construction source emission rates were obtained from *Compilation of Air Pollution Emission Factors, AP-42, Volume I* (EPA 1995); the EPA NONROAD Model for nonroad construction equipment (EPA 2009); and the MOBILE6.2 Model for on-road vehicles (EPA 2003).

The analysis reduced fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels to simulate implementation of Best Management Practices (BMPs) for fugitive dust control. Chapter 3, Section 3.3, of this EIS lists these BMPs.

Table BO 3.3–3 presents estimates of emissions from construction activities that would occur under Scenario B3 at Boise AGS. These data show that, if all construction activities occurred in 1 year, total CO and PM_{10} emissions would be well below the conformity *de minimis* thresholds. Ada County is in attainment of the NAAQS for O_3, NO_2, SO_2, and $PM_{2.5}$, and conformity *de minimis* thresholds do not apply for these pollutants or their precursors. When compared with the PSD thresholds used to indicate significance or nonsignificance, the construction emissions fall well below the indicators. Therefore, temporary construction emission impacts on regional air quality are not expected to be significant. The main sources of PM_{10}/$PM_{2.5}$ emissions would occur as fugitive dust from the operation of equipment on unpaved surfaces.

Operations

The air quality impact analysis of F-35A aircraft operations at Boise AGS is based upon the net change in emissions resulting from the replacement of existing A-10 operations with F-35A operations. The A-10 scenario starting point for the base case period for comparison to F-35A operations is 2009. Therefore, the net change in annual operational emissions associated with the beddown of F-35A aircraft at Boise AGS is equal to emissions from the F-35A action for a given year minus emissions from A-10 operations replaced at that time.

Sources associated with the beddown of F-35A aircraft at Boise AGS would include (1) operations and engine maintenance/testing of F-35A aircraft, (2) onsite POVs and GOVs, (3) offsite POV commutes, (4) AGE, (5) nonroad mobile equipment, and (6) stationary and other sources. Emissions due to offsite staff commuter vehicles were estimated using the same methods as those identified for existing Boise AGS commuter activities in 2009 (AQD 2010b; CPASI 2003). Operational data used to calculate projected F-35A aircraft emissions at Boise AGS were obtained from data used in the project noise analyses (see Section BO 3.2).

Emissions from projected onsite POV and GOV sources were estimated by multiplying the existing emissions from these sources by the ratio of the projected F-35A and 2009 Boise AGS (Air National Guard [ANG] only) basing populations. Emissions from nonroad and stationary sources were estimated by multiplying existing emissions for each source category by the ratio of projected F-35A and actual 2009 A-10 aircraft numbers. Emissions from projected AGE usages are based upon legacy AGE usages for F-16 aircraft and new AGE usages projected for F-35A aircraft. Emissions from projected offsite POV commuting activities were estimated by multiplying the vehicle miles traveled in 2009 by Boise AGS staff (ANG only) by the ratio of projected F-35A and 2009 Boise AGS (ANG only) basing populations and then multiplying by future year MOBILE6.2 emission factors.

Table BO 3.3–3. Scenario B3 Total Construction Emissions

	Air Pollutant Emissions (tons)						
Construction Activity	**VOCs**	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Squadron Operations – 1st	0.03	0.18	0.28	0.01	0.11	0.04	37.0
Squadron Operations – 2nd	0.03	0.16	0.25	0.01	8.28	0.85	33.2
Squadron Operations /Aircraft Maintenance Unit – 3rd	0.04	0.23	0.36	0.01	0.22	0.06	47.6
Simulators	0.03	0.17	0.27	0.01	0.13	0.04	34.9
Academic Training Center for 3rd Squadron	0.12	0.61	0.97	0.02	1.07	0.20	126.8
Operational Training Facility	0.02	0.09	0.14	0.00	0.04	0.02	18.8
Maintenance Hangars	0.02	0.09	0.14	0.00	0.04	0.02	18.1
Hangar Upgrades	0.03	0.14	0.23	0.01	0.09	0.03	29.6
Battery Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.1
Ejection Seat Maintenance	0.00	0.02	0.03	0.00	0.00	0.00	3.5
Flightline Maintenance Facility	0.00	0.01	0.02	0.00	0.00	0.00	3.1
Engine Maintenance	0.00	0.00	0.01	0.00	0.00	0.00	0.9
Corrosion Control Hangar	0.01	0.07	0.10	0.00	0.03	0.01	13.6
Gun System Maintenance Shop	0.00	0.02	0.03	0.00	0.00	0.00	3.4
Support (AGE) Maintenance Facility	0.01	0.06	0.10	0.00	0.02	0.01	12.5
Interim Moves and Relocations	0.10	0.53	0.85	0.02	0.19	0.10	111.0
Aircraft Arrest System (BAK012ER)	0.01	0.07	0.11	0.00	0.03	0.01	14.8
Bulk Fuel Storage	0.02	0.12	0.20	0.01	0.06	0.02	25.9
Communications Security Space	0.00	0.01	0.02	0.00	0.00	0.00	2.1
Electrical Infrastructure	0.01	0.05	0.09	0.00	0.02	0.01	11.1
AGE Storage Area – outdoor/covered	0.01	0.04	0.07	0.00	0.02	0.01	9.3
Apron Re-stripe	0.00	0.00	0.01	0.00	0.00	0.00	0.9
Runway Improvements (Hold Short Lines) – Asphalt Removal	0.02	0.10	0.17	0.00	0.05	0.02	24.30
Runway Improvements (Hold Short Lines) – Pour Concrete	0.02	0.09	0.25	0.00	0.02	0.01	39.60
Runway Approach End (1,000-feet long) – Asphalt Removal	0.02	0.10	0.17	0.00	0.02	0.01	24.30
Runway Approach End (1,000-feet long) – Pour Concrete	0.01	0.05	0.16	0.00	0.01	0.01	28.27
Taxiway (75-feet wide) – Asphalt Removal	0.03	0.19	0.34	0.01	0.06	0.03	47.88
Taxiway (75-feet wide) – Pour Concrete	0.03	0.14	0.40	0.01	0.02	0.02	66.45
Parking Apron – Asphalt Removal	0.00	0.02	0.03	0.00	0.00	0.00	4.13
Parking Apron – Pour Concrete	0.00	0.01	0.03	0.00	0.00	0.00	5.31
Total Annual Emissions[1]	**0.62**	**3.37**	**5.83**	**0.14**	**10.53**	**1.53**	**798.44**
Ada County PSD and Conformity Thresholds	**250**	**100**	**250**	**250**	**100**	**250**	**N/A**

[1] All emissions are assumed to occur in calendar year 2012.

Tables BO 3.3–4, BO 3.3–5, and BO 3.3–6 summarize the annual emissions that would occur under Scenarios B1, B2, and B3, respectively, from the potential build-out of 24 to 72 F-35A aircraft at Boise AGS. These data show that, with the addition of 24 (Scenario B1) or 48 (Scenario B2) F-35A aircraft, the increase in annual emissions from these actions would not exceed any applicable conformity or National Environmental Policy Act (NEPA) significance threshold for the Ada County project region. However, with the addition of 72 (Scenario B3) F-35A aircraft, the annual increase in emissions from this action would exceed the applicable CO general conformity *de minimis* threshold, which triggers the requirement for a positive general conformity determination before activities under Scenario B3 may proceed. The projected increases in all other emissions from these three scenarios would not exceed any applicable conformity or NEPA significance threshold. However, a final positive general conformity determination would be required before any final decision to implement Scenario B3 at Boise AGS could be made. The main contributors to the projected emission increases would include F-35A aircraft operations and POVs that would commute to and from Boise AGS.

Table BO 3.3–4. Scenario B1 Annual Operational Emissions at Boise AGS

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
F-35A Operations and AGE	1.55	50.10	41.94	4.49	0.73	0.73	14,841
Onsite POVs/GOVs	0.19	2.21	0.47	0.06	0.02	0.02	252
Offsite POVs	1.47	41.47	1.38	0.04	0.12	0.11	2,570
Nonroad	0.25	1.43	3.52	0.09	0.24	0.23	369
Point and Area Sources	3.74	1.33	1.17	0.01	0.56	0.51	1,109
Total Projected Emissions – Scenario B1	**7.19**	**96.55**	**48.47**	**4.69**	**1.67**	**1.60**	**19,141**
Ada County PSD and Conformity Thresholds	**250**	**100**	**250**	**250**	**100**	**250**	**N/A**

Table BO 3.3–5. Scenario B2 Annual Operational Emissions at Boise AGS

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
F-35A Operations and AGE	3.10	100.19	83.89	8.98	1.46	1.46	29,684
Onsite POVs/GOVs	0.30	3.65	0.70	0.11	0.04	0.03	429
Offsite POVs	2.29	68.39	2.06	0.07	0.14	0.14	3,201
Nonroad	0.46	2.60	6.56	0.17	0.44	0.43	687
Point and Area Sources	7.47	2.66	2.34	0.01	1.11	1.02	2,217
Total Projected Emissions – Scenario B2	**13.62**	**177.49**	**95.55**	**9.35**	**3.19**	**3.08**	**36,218**
A-10 Year 2009 Base Case Emissions	**(18.63)**	**(106.47)**	**(12.77)**	**(0.77)**	**(1.49)**	**(1.43)**	**(5,805)**
Scenario B2 Minus Base Case Emissions	**(5.01)**	**71.01**	**82.77**	**8.58**	**1.70**	**1.65**	**30,413**
Ada County PSD and Conformity Thresholds	**250**	**100**	**250**	**250**	**100**	**250**	**N/A**

Note: (Number) denotes a negative number.

Table BO 3.3–6. Scenario B3 Annual Operational Emissions at Boise AGS

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	4.65	150.28	125.82	13.47	2.19	2.19	44,522
Onsite POVs/GOVs	0.44	5.58	0.97	0.17	0.06	0.05	676
Offsite POVs	3.34	104.95	2.84	0.11	0.22	0.22	5,051
Nonroad	0.62	3.49	9.14	0.25	0.61	0.59	955
Point and Area Sources	11.21	3.98	3.51	0.02	1.67	1.54	3,326
Total Projected Emissions – Scenario B3	**20.26**	**268.28**	**142.28**	**14.02**	**4.75**	**4.59**	**54,530**
A-10 Year 2009 Base Case Emissions	**(18.63)**	**(106.47)**	**(12.77)**	**(0.77)**	**(1.49)**	**(1.43)**	**(5,805)**
Scenario B3 Minus Base Case Emissions	**1.63**	**161.82**	**129.50**	**13.26**	**3.26**	**3.16**	**48,725**
Ada County PSD and Conformity Thresholds	**250**	**100**	**250**	**250**	**100**	**250**	**N/A**

Note: (Number) denotes a negative number.

The results of the conformity applicability analysis for the F-35A beddown scenarios at Boise AGS show that proposed PM_{10} emissions are *de minimis* for all scenarios, but proposed CO emissions would exceed the conformity *de minimis* threshold of 100 tons per year under Scenario B3. The Air Force would apply one or more of the criteria under 40 CFR, Section 93.158(a), to make a draft general conformity determination for proposed CO emissions and a positive final general conformity determination after the public has an opportunity to review and comment on the draft conformity determination.

In addition to presenting estimates of GHG emissions that would occur under the F-35A beddown scenarios at Boise AGS, the following considers how climate change could impact the F-35A beddown scenarios at Boise AGS and what adaptation strategies, if any, would be required to respond to these future conditions. For Boise AGS, the main effect of climate change to consider is increased temperatures, as documented in *Global Climate Change Impacts in the United States* (USGCRP 2009). This report predicts that in the future, higher temperatures in the northwest region (1) will increase droughts and wildfires and (2) will reduce springtime snow packs, summer stream flows, and water supplies. Operations at Boise AGS have adapted to droughts and scarce water supplies. However, exacerbation of these conditions in the future would increase the cost of proposed operations at Boise AGS and would impede operations during extreme events. Additional measures would be needed to mitigate these occurrences. Since brush and grassland plant communities border Boise AGS, an increase in wildfires in the region could interrupt proposed operations and could cause smoke obscurations from these events. Therefore, additional measures would be needed to protect infrastructure and personnel from increased wildfires.

BO 3.3.2 Airspace

BO 3.3.2.1 Airspace Affected Environment

Projected F-35A aircraft operations within training areas, auxiliary airfields, and aircraft flight routes between these locations and Boise AGS would affect air quality within portions of Idaho,

Utah, Nevada, Oregon, and Montana. These airspace units currently attain all of the NAAQS. In addition, the primary use airspace units are outside of the Ada County maintenance areas for CO and PM_{10}.

Requirements for Class I Areas. As part of the PSD Regulation, the Federal Clean Air Act provides special protection for air quality and air-quality-related values (including visibility and pollutant deposition) in selected areas of the United States (national parks greater than 6,000 acres or national wilderness areas greater than 5,000 acres). These Class I areas are areas where any appreciable deterioration of air quality is considered significant. In 1999, the EPA promulgated a regional haze regulation that requires states to establish goals and emission reduction strategies to make initial improvements in visibility within their respective Class I areas (EPA 1999). Visibility impairment is defined as (1) a reduction in the regional visual range and (2) atmospheric discoloration or plume blight. Several of the MTRs and the Jarbidge and Paradise MOAs proposed for use by the F-35A aircraft are either in close proximity to or overlie pristine Class I areas, including the (1) Jarbidge Wilderness Area, (2) Sawtooth Wilderness Area, (3) Hells Canyon Wilderness Area, and (4) Selway-Bitterroot Wilderness Area. Criteria to determine the significance of air quality impacts within Class I areas usually pertain to stationary emission sources, as mobile sources are generally exempt from permit review by regulatory agencies. However, Section 169A of the Clean Air Act states the Federal goal of prevention of any future impairment of visibility within Class I areas from manmade sources of air pollution. Therefore, due to the proximity of these pristine areas to projected aircraft operations, this EIS provides a qualitative analysis of the potential for projected emissions to affect visibility within these areas.

Table BO 3.3–7 presents an estimation of annual emissions due to A-10 aircraft operations within the Boise AGS airspace units during the base case year of 2009. Because the floors of (1) Jarbidge South, (2) Paradise North and South, (3) Owyhee South, and (4) Saddle A and B MOAs do not extend below 3,000 feet AGL, no A-10 aircraft emissions are presented for these airspace units. Under Scenarios B2 and B3, operation of F-35A aircraft would completely replace the emissions produced by existing A-10 operations.

Table BO 3.3–7. Annual Emissions from A-10 Operations within Boise AGS Airspace Units, 2009 Base Case

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e}
Jarbidge North MOA/ATCAA[1]	0.94	9.39	20.73	2.35	6.27	6.27	7,506
Owyhee North MOA/ATCAA[2]	0.64	6.44	14.22	1.61	4.30	4.30	5,147
IR-301/307	0.01	0.06	0.13	0.01	0.04	0.04	48
IR-302/305	0.01	0.13	0.30	0.03	0.09	0.09	107
VR-316/319	0.00	0.05	0.10	0.01	0.03	0.03	38
VR-1302	0.00	0.03	0.06	0.01	0.02	0.02	23
Mountain Home AFB Auxiliary Airfield	0.00	0.02	0.05	0.00	0.02	0.02	18
Total Existing Emissions	**1.61**	**16.12**	**35.59**	**4.03**	**10.76**	**10.76**	**12,886**

[1] Includes operations within R-3202.
[2] Includes operations within R-3204A/B.
Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL.

BO 3.3.2.2 Airspace Environmental Consequences

Primary use airspace proposed for use by F-35A aircraft in Idaho, Utah, Nevada, Oregon, and Montana currently attain all of the NAAQS. Therefore, the analysis used the PSD threshold for new major sources of 250 tons per year as an indicator of significance for attainment pollutant emissions. If they exceed these levels, further analysis was conducted to determine whether impacts were significant. The analysis also evaluated how projected emissions would affect air quality within Federal Class I areas adjacent to these airspace units.

Operations

The air quality impact analysis of F-35A aircraft operations within Boise AGS airspace units is based upon the net change in emissions resulting from the replacement of existing A-10 operations with F-35A operations. The A-10 scenario starting point for the base case period for comparison to F-35A operations is 2009. Therefore, the net change in annual operational emissions within the airspace units is equal to emissions from the F-35A action for a given year minus emissions from A-10 operations replaced at that time.

Sources associated with the beddown of F-35A aircraft within the Boise AGS airspace units and aircraft flight routes would include inflight F-35A aircraft operations. Operational data used to calculate projected F-35A aircraft emissions at Boise AGS were obtained from data used in the project noise analyses (see Section BO 3.2).

Tables BO 3.3–8, BO 3.3–9, and BO 3.3–10 summarize the annual emissions that would occur under Scenarios B1, B2, and B3, respectively, from the operation of 24, 48, and 72 F-35A aircraft within the Boise AGS airspace units. Since proposed aircraft operations within the (1) Jarbidge South, (2) Paradise North and South, (3) Owyhee South, and (4) Saddle A and B MOAs/ATCAAs would occur at least 3,000 feet AGL, no emissions are presented for these airspace units. The data in Tables BO 3.3–8 and BO 3.3–9 show that, with the addition of 24 (Scenario B1) or 48 (Scenario B2) F-35A aircraft, the increase in annual emissions from these actions for all pollutants would not exceed 250 tons per year. Therefore, these actions would produce less than significant impacts on all air pollutant levels.

Review of Table BO 3.3–10 shows that the addition of 72 F-35A aircraft (Scenario B3) would increase annual NO_X emissions within the Boise AGS airspace units by about 335 tons per year, which would exceed the NO_X PSD threshold of 250 tons per year. The F-35A aircraft would operate intermittently over a depth of atmosphere and region that includes approximately 1,560 miles of aircraft training routes and 5,700 square miles of airspace. The distribution of F-35A aircraft emissions over such a large geographic area would substantially dilute their ambient concentrations upon contact with the ground. Therefore, the combination of these emissions with the low ambient pollutant levels in the ROI would not contribute to an exceedance of an NAAQS. As a result, F-35A operations within the Boise AGS airspace units would produce less than significant impacts on NAAQS pollutant levels.

Table BO 3.3–8. Scenario B1 Annual Operational Emissions within Boise AGS Airspace Units

Activity	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e}
Jarbidge North MOA/ATCAA[1]	0.00	0.40	22.35	0.95	0.10	0.10	3,105
Owyhee North MOA/ATCAA[2]	0.00	0.33	18.36	0.78	0.08	0.08	2,551
IR-301/307	0.00	0.41	23.31	0.99	0.10	0.10	3,238
IR-302/305	0.00	0.57	32.02	1.36	0.14	0.14	4,449
VR-316/319	0.00	0.06	3.57	0.15	0.02	0.02	497
VR-1302	0.00	0.01	0.32	0.01	0.00	0.00	44
Mountain Home AFB Auxiliary Airfield	0.07	2.21	23.53	1.92	0.17	0.17	6,278
Total Projected Emissions – Scenario B1	**0.07**	**3.99**	**123.46**	**6.16**	**0.61**	**0.61**	**20,162**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

[1] Includes operations within R-3202.
[2] Includes operations within R-3204A/B.
Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL.

Table BO 3.3–9. Scenario B2 Annual Operational Emissions within Boise AGS Airspace Units

Activity	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e}
Jarbidge North MOA/ATCAA[1]	0.01	0.80	44.71	1.90	0.20	0.20	6,210
Owyhee North MOA/ATCAA[2]	0.00	0.65	36.73	1.56	0.17	0.17	5,102
IR-301/307	0.01	0.83	46.62	1.99	0.21	0.21	6,476
IR-302/305	0.01	1.14	64.05	2.73	0.29	0.29	8,897
VR-316/319	0.00	0.13	7.15	0.30	0.03	0.03	993
VR-1302	0.00	0.01	0.64	0.03	0.00	0.00	89
Mountain Home AFB Auxiliary Airfield	0.14	4.41	47.06	3.85	0.33	0.33	12,557
Total Projected Emissions – Scenario B2	**0.17**	**7.97**	**246.96**	**12.36**	**1.23**	**1.23**	**40,324**
A-10 Year 2009 Base Case Emissions	**1.61**	**16.12**	**35.59**	**4.03**	**10.76**	**10.76**	**12,886**
Scenario B2 Minus Base Case Emissions	**(1.44)**	**(8.15)**	**211.35**	**8.33**	**(9.53)**	**(9.53)**	**27,439**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

[1] Includes operations within R-3202.
[2] Includes operations within R-3204A/B.
Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL; (Number) denotes a negative number.

Table BO 3.3–10. Scenario B3 Annual Operational Emissions within Boise AGS Airspace Units

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e}
Jarbidge North MOA/ATCAA[1]	0.01	1.19	67.06	2.86	0.30	0.30	9,316
Owyhee North MOA/ATCAA[2]	0.01	0.98	55.09	2.35	0.25	0.25	7,653
IR-301/307	0.01	1.24	69.93	2.98	0.31	0.31	9,714
IR-302/305	0.01	1.71	96.07	4.09	0.43	0.43	13,346
VR-316/319	0.00	0.19	10.72	0.46	0.05	0.05	1,490
VR-1302	0.00	0.02	0.96	0.04	0.00	0.00	133
Mountain Home AFB Auxiliary Airfield	0.21	6.62	70.58	5.77	0.50	0.50	18,835
Total Projected Emissions – Scenario B3	**0.25**	**11.95**	**370.41**	**18.55**	**1.84**	**1.84**	**60,487**
A-10 Year 2009 Base Case Emissions	**1.61**	**16.12**	**35.59**	**4.03**	**10.76**	**10.76**	**12,886**
Scenario B3 Minus Base Case Emissions	**(1.36)**	**(4.16)**	**334.82**	**14.51**	**(8.91)**	**(8.91)**	**47,601**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

[1] Includes operations within R-3202.
[2] Includes operations within R-3204A/B.
Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL; (Number) denotes a negative number.

Due to the presence of pristine Class I areas within the project region, F-35A emissions that occur within airspace units have the potential to impair visibility within these areas. The Class I area of most concern is the Jarbidge Wilderness Area in northern Nevada, as training route IR-302/305 and the Jarbidge MOA are directly adjacent to this pristine area. All other airspace units would occur at a sufficient distance and/or produce minimal F-35A operations such that they would produce inconsequential air quality impacts within the remaining Class I areas in the project region. Visibility impairment could occur from projected primary emissions of NO_2, SO_2, and PM_{10} or secondary formation of visibility-reducing particulate matter in the atmosphere due to precursor emissions of VOCs, NO_2, or SO_2. Visibility impairment from primary NO_2 emissions could occur as a brown-colored haze in the lower layer of the atmosphere. This situation usually would occur during the colder months of the year, when a lack of sunlight prevents the conversion of this pollutant to NO_X and oxygen. Visibility impairment due to primary PM_{10} emissions would occur in the form of plume blight or atmospheric discoloration from contrails. Visibility impairment due to the secondary formation of nitrate or sulfate particulates in the atmosphere from emissions of NO_X or SO_2 would usually occur in the warmer months of the year. This effect would take the form of regional haze, which would reduce regional visual range.

To provide an indication of the level of emissions that would occur in proximity to the Jarbidge Wilderness Area, Table BO 3.3–11 provides an analysis of the net change in annual emissions that would occur between existing A-10 and projected F-35A operations within (1) the Jarbidge North MOA/ATCAA and (2) training route IR-302/305 in proximity to this pristine area (within about 20 miles). The data in Table BO 3.3–11 show that, under Scenario B1, the addition of 24 F-35A aircraft would increase all pollutants in proximity to the Jarbidge Wilderness Area, particularly NO_X. With the addition of 48 (Scenario B2) and 72 (Scenario B3) F-35A aircraft,

these actions would further increase NO_X emissions, but they would decrease emissions of (1) all other pollutants under Scenario B2 and (2) all other pollutants except SO_2 under Scenario B3. Most of these NO_X emission increases would occur more than 10 miles away in the northern portions of the Jarbidge North MOA and in or near the Saylor Creek and Juniper Butte Ranges. During periods when winds would transport F-35A emissions within this airspace unit to the Jarbidge Wilderness Area, the dispersion associated with such a long travel distance would substantially dilute their concentrations upon arrival in the Jarbidge Wilderness Area. As a result, F-35A operations adjacent to the Jarbidge Wilderness Area would not substantially contribute to visibility impairment within this pristine area.

Table BO 3.3–11. Net Change in F-35A Aircraft Emissions within the Jarbidge MOA and IR-302/305

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
A-10 2009 Base Case Operations – Jarbidge North MOA	0.94	9.39	20.73	2.35	6.27	6.27	7,506
A-10 2009 Base Case Operations – IR-302/305[1]	0.00	0.02	0.05	0.01	0.01	0.01	17
Total A-10 2009 Base Case Operations	**0.94**	**9.41**	**20.78**	**2.36**	**6.28**	**6.28**	**7,522**
Scenario B1–Jarbidge North MOA	0.00	0.40	22.35	0.95	0.10	0.10	3,105
Scenario B1–IR-302/305[1]	0.00	0.09	4.98	0.21	0.02	0.02	692
Scenario B1 Total (24 F-35A Aircraft)	**0.00**	**0.49**	**27.33**	**1.16**	**0.12**	**0.12**	**3,797**
Scenario B2–Jarbidge North MOA	0.01	0.80	44.71	1.90	0.20	0.20	6,210
Scenario B2–IR-302/305[1]	0.00	0.18	9.96	0.42	0.04	0.04	1,384
Scenario B2 Total (48 F-35A Aircraft)	**0.01**	**0.98**	**54.67**	**2.32**	**0.24**	**0.24**	**7,594**
Scenario B2 Minus Base Case Emissions	**(0.93)**	**(8.44)**	**33.89**	**(0.03)**	**(6.04)**	**(6.04)**	**72**
Scenario B3–Jarbidge North MOA	0.01	1.19	67.06	2.86	0.30	0.30	9,316
Scenario B3–IR-302/305[1]	0.00	0.27	14.94	0.64	0.07	0.07	2,076
Scenario B3 Total (72 F-35A Aircraft)	**0.01**	**1.46**	**82.00**	**3.49**	**0.37**	**0.37**	**11,392**
Scenario B3 Minus Base Case Emissions	**(0.93)**	**(7.95)**	**61.23**	**1.14**	**(5.91)**	**(5.91)**	**3,869**

[1] Within 20 miles of the Jarbidge Wilderness Area.
Note: (Number) denotes a negative number.

Proposed F-35A operations within the Jarbidge South MOA also would affect visibility within the Jarbidge Wilderness Area, as a portion of it overlies this Class I area. The proposed action would operate up to 507 F-35A sorties per year (Scenario B3) within the combined Jarbidge South, Owyhee South, and Paradise South/North MOAs. About 2 percent of this combined airspace occurs over the Jarbidge Wilderness Area. Based upon an F-35A sortie duration of 45 minutes, the annual residence time of proposed F-35A aircraft within the Jarbidge Wilderness Area would not exceed 7.6 hours. The proposed F-35A operations within the Jarbidge Wilderness Area also would occur at least 3,000 feet AGL. Therefore, air emissions from this minimal duration of proposed F-35A operations at such a high altitude would not substantially degrade regional visibility within the Jarbidge Wilderness Area. The

proposed F-35A operations also would produce plume blight that is visible from the Jarbidge Wilderness Area. However, due to the transitory nature of these emissions, they would not result in visibility impairment within this pristine area. Therefore, F-35A operations within the Boise AGS primary use airspaces would produce less than significant contributions to visibility impairment within Class I areas in the project region.

BO 3.4 Safety

BO 3.4.1 Base

BO 3.4.1.1 Base Affected Environment

Ground Safety

Ground safety includes many categories (Air Force Instruction [AFI] 91-204) (Air Force 2008) consisting of ground and industrial operations, operational and occupational safety hazards, motor vehicle use, off-duty military and maritime activities, and fire. Ground mishaps can occur on ground or water, on or off an installation, and may involve Air Force personnel, contractors, and property losses. They can occur in a work environment from the use of equipment or materials, including administrative, supply, custodial, and maintenance for Air Force functions. Day-to-day construction operations under each of the proposed scenarios are required to be performed in accordance with all applicable Air Force safety regulations; published Air Force technical orders; and Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) requirements. On-base construction and demolition activities are required to have an appropriate job site safety plan, which would explain how tasks would be accomplished while assuring job safety throughout the life of the project. Construction and demolition workers are also required to follow applicable OSHA requirements. Occupational health and safety would be governed by the terms of the contract, which may incorporate Air Force regulations and technical orders, AFOSH standards, and OSHA standards.

Boise Air Terminal Airport is a joint use facility, supporting both the 124 FW and the City of Boise. The City of Boise has primary crash response responsibility on the airport, but the military fire department also responds. All required equipment is available. The 124 FW facilities have, or are programmed to have, all required fire annunciation and suppression systems in place, and hangars are equipped with automatic fire suppression capability.

Anti-Terrorism/Force Protection (AT/FP). AT/FP is a security program designed to protect Air Force active duty personnel, civilian employees, family members, and facilities and equipment in all locations and situations. The program is accomplished through the planned and integrated application of anti-terrorism measures, physical security, operations security, and personal protective services. It is supported by intelligence, counterintelligence, and other security programs. In response to terrorist attacks, several regulations have been promulgated to ensure that force protection standards are incorporated into the planning, programming, and budgeting for the design and construction of military construction-funded facilities. *DoD Minimum Antiterrorism Standards for Buildings* (DoD 2003), published in 2003 and updated

in 2007, establishes minimum standoff distances that must be maintained between several categories of structures and areas that are relatively accessible to terrorists.

The intent of this siting and design guidance is to improve security, minimize fatalities, and limit damage to facilities in the event of a terrorist attack. Many military installations, such as the 124 FW facilities, were developed before AT/FP considerations became a critical concern. Thus, under current conditions, many installations are not able to comply with all present AT/FP standards. However, as new construction occurs, these standards would be incorporated into the design, and as facilities are modified, AT/FP standards would be incorporated to the maximum extent practicable.

Airfield Safety

Boise Air Terminal Airport. Boise Air Terminal Airport/Boise AGS is located at 43° 33′ 52″ north and 116° 13′ 22″ west, with a field elevation of 2,871 feet MSL. The airfield consists of two parallel runways (staggered approximately 0.5 miles from each other) oriented on magnetic bearings of 100.7° and 280.8° (southeast to northwest) (AirNav 2010; FAA 2010a).

Runway 10L/28R is 10,000 feet long by 150 feet wide and is composed of grooved asphalt with 25-foot paved shoulders on both sides and a 200-foot blast area extending beyond the threshold of Runway 28R. Runway elevation slopes upward from 2,831 feet MSL at the 10L end to 2,871 feet MSL at the 28R end (a 0.4 percent slope). Runway 10L/28R is equipped with high-intensity runway lights and threshold lights that outline the edges and ends of the runway as well as runway end identifier lights, consisting of a pair of synchronized flashing lights located on each side of the runway threshold, at the approach end of Runway 10L. Runway 10L/28R also has designation markings, threshold and runway edge markings, centerline markings, and aiming point markings (AirNav 2010; Boise 2008a; FAA 2010a).

Runway 10R/28L is 9,763 feet long by 150 feet wide and is composed of asphalt and porous friction courses over base and sub-base material and has 25-foot paved shoulders on either side of the runway. Runway elevation slopes upward from 2,824 feet MSL at the 10R end to 2,858 feet MSL at the 28L end (0.4 percent slope). Runway 10R/28L is equipped with high-intensity runway lights and threshold lights that outline the edges and ends of the runway, as well as centerline lighting and touchdown zone lighting. Runway 10R has a simplified short approach lighting system, and Runway 28L has a 1,400-foot medium-intensity approach lighting system. Runway 10R/28L is marked as a precision instrument runway and includes designation markings, threshold and runway edge markings, centerline markings, aiming point markings, and touchdown zone markings (AirNav 2010; Boise 2008a).

The taxiway system at Boise Air Terminal Airport consists primarily of two parallel taxiways and several connecting taxiways. Runway 10L/28R has a full-length taxiway (Taxiway A) located north of, and parallel to, the runway, with a centerline-to-centerline separation of 400 feet from the runway. The taxiway provides access to the passenger terminal, general aviation areas, and cargo facilities, as well as other facilities located on the north side of the airfield. Runway 10R/28L has a partial parallel taxiway (Taxiway B), which provides access to Idaho Air National Guard (Idaho ANG) facilities, located south of the runway, with a centerline-to-centerline separation of 437.5 feet from the runway. A restricted access military taxiway is located south of Taxiway B and provides access to the military areas of the facility,

including the helicopter apron. These taxiways are at least 75 feet wide and have either 25- or 35-foot shoulders (Boise 2008a).

Runway Protection Zones (RPZs). RPZs for airports such as Boise Air Terminal Airport are trapezoidal zones extending outward from the ends of active runways at commercial airports that delineate those areas recognized as having the greatest risk of aircraft mishaps, most of which occur during takeoff or landing. The RPZs function is to enhance the protection of people and property on the ground. This is achieved through airport owner control of RPZs. Development restrictions within RPZs are intended to preclude incompatible land use activities from being established in these areas. Such control includes clearing RPZ areas (and keeping them clear) of incompatible objects and activities. The RPZ dimension for a particular runway end is a function of the type of aircraft and minimum approach visibility associated with that runway end. For most commercial airports with large aircraft, the departure RPZ begins 200 feet from the end of the runway and continues out to 1,700 feet, with a width beginning at 500 feet and expanding as the distance from the runway increases to 1,010 feet wide (FAA 2009a). The approach RPZ begins 200 feet before the runway threshold and extends out 1,700 feet in a reverse of the departure RPZ (FAA 2009a) (see Figure BO 3.4–1).

Runway Safety Area (RSA). RSA is an area centered on the runway centerline that must be cleared and graded and capable, under normal dry conditions, of supporting the weight of an airplane without causing structural damage to the airplane or injuries to the occupants. RSA enhances the safety of aircraft that undershoot, overrun, or veer off the runway, and it provides greater accessibility for fire fighting and rescue equipment should an accident occur. RSA is within the Runway Object-Free Area (OFA), which must be kept clear of objects not required for aircraft ground maneuvering. Airport Reference Code (ARC) C-VI design standards, which apply to Boise Air Terminal Airport, require RSA to be 500 feet wide and to extend 1,000 feet beyond each end of the pavement.

Runway Object-Free Area (OFA). OFA is an area on the ground centered on the runway, taxiway, or taxi lane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in OFA for air navigation or aircraft ground maneuvering purposes. Parked airplanes and agricultural operations are not permitted in OFA.

Runway Obstacle-Free Zone (OFZ). OFZ is the airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual navigational aids that need to be located in OFZ because of their function, to provide clearance protection for aircraft landing or taking off from the runway and for missed approaches.

Relevant FAA Design Standards – 14 CFR Part 77, "Objects Affecting Navigable Airspace." Objects located beyond OFA, RSA (including taxiways), OFZ, and RPZ, but in the vicinity of the runway, may be considered obstructions. Objects that are considered obstructions require lighting, lowering, or removal, as determined by 14 CFR Part 77, "Objects Affecting Navigable Airspace."

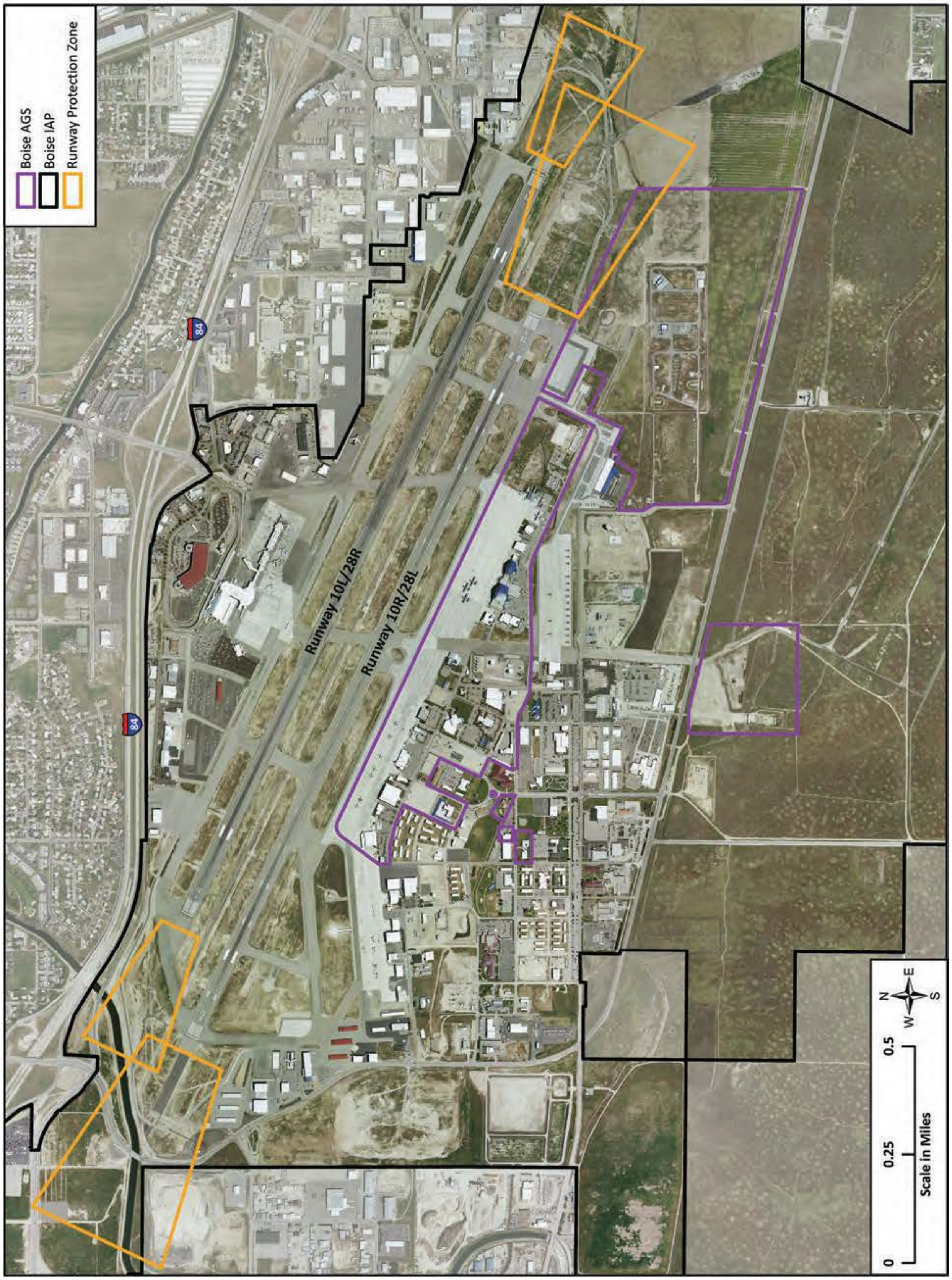


Figure BO 3.4–1. Runway Protection Zones at Boise AGS

Airspace in the vicinity of Boise Air Terminal Airport is categorized as Class C. Class C airspace around Boise Air Terminal Airport has a surface area with a 5-NM radius extending to 6,800 feet MSL and an outer circle with a 10-NM radius, extending from 4,200 or 4,600 feet MSL to 6,900 feet MSL. The nearest Class D airspace is found at Mountain Home AFB, approximately 35 NM southeast of Boise Air Terminal Airport (Boise 2008a).

Salt Lake City ARTCC is responsible for the airspace in the vicinity of Boise Air Terminal Airport/Boise AGS. Salt Lake City ARTCC routes and controls air traffic in the airspace within portions of Idaho, Montana, Wyoming, Utah, Nevada, Oregon, North Dakota, and South Dakota. Seattle ARTCC is responsible for airspace in the panhandle of Idaho and in areas to the west. A TRACON facility located at the ATC center at Boise Air Terminal Airport is responsible for aircraft in the arrival and departure areas. A letter of agreement between Salt Lake City ARTCC and numerous airport facilities (including Boise Air Terminal Airport) delegates areas of jurisdiction and establishes procedures for coordinating air traffic.

Gowen Assault Strip. In addition to the two commercial runways, an assault strip, constructed in 2002, is located south of Gowen Road; Gowen Assault Strip has a centerline-to-centerline separation of 5,450 feet from Runway 10R/28L and is used primarily for military training activity associated with 124 FW. The strip is 5,000 feet long and 90 feet wide, with safety areas graded on both sides and at both ends; its pavement consists of 6 inches of asphalt concrete pavement over approximately 18 inches of base and sub-base material. The assault strip does not have runway lighting or aviation marking and is not available for commercial aircraft use (Boise 2008a).

Ground Obstructions. Because this is a joint use facility with the airfield maintained by the City of Boise Department of Aviation and Public Transportation, airfield obstructions are in accordance with FAA Advisory Circular 150/5340-1, *Standards for Airport Markings* (FAA 2010b) and are the responsibility of the airport authority.

Explosives Safety

124 FW controls, maintains, and stores all ordnance and munitions required for mission performance in accordance with Air Force and Department of Defense Explosives Safety Board (DDESB) safety procedures. All ordnance required by 124 FW for its day-to-day mission is stored on the installation. Siting requirements for munitions and ammunition storage and handling facilities are based on safety and security criteria. Defined distances are maintained between munitions storage areas and a variety of other types of facilities. These distances, defined by quantity-distance (Q-D) arcs, are determined by the type and quantity of explosive material to be stored. Within these Q-D arcs, development is either restricted or prohibited altogether to ensure safety of personnel and minimize potential for damage to other facilities in the event of an accident. In addition, explosives storage and handling facilities must be located in areas where security of the munitions can be maintained at all times. Identifying the Q-D arcs ensures that construction does not occur within these areas.

Munitions storage on Boise AGS is limited to storage of Bomb Dummy Units (BDUs). All storage facilities are fully licensed for the type of ordnance stored, and no safety waivers are in effect. A new munitions storage area is located approximately 2,000 feet south of the southeastern end of Runway 28L. The former munitions storage area is located in a currently

vacant lot (14.6 acres) adjacent to the west side of the current munitions storage area (Idaho ANG 2009). Arming and disarming of aircraft with BDUs take place primarily in two areas on the main aircraft apron controlled exclusively by the 124 FW, one at the southern end of Taxiway B and the other adjacent to the south cargo apron along Taxiway J (Boise 2008a).

Explosive ordnance disposal technicians are stationed at Mountain Home AFB and would support 124 FW requirements, if necessary. Any high-explosives ordnance used by 124 FW aircraft would be loaded at Mountain Home AFB. During training, aircraft are not loaded with any ordnance configured with high-explosives warheads. Inert training bombs and several different types of rockets are delivered on air-to-ground ranges, as well as 30-millimeter training projectiles fired from the aircrafts' guns.

Ordnance expenditure during training is limited to ranges within restricted airspace. Air Force safety standards require safeguards on weapons systems and ordnance to ensure against inadvertent releases. All munitions mounted on an aircraft, as well as the guns, are equipped with mechanisms that preclude release or firing without activation of an electronic arming circuit. System malfunctions or material failures could result in either an accidental release of ordnance or the release of a dud component that fails to operate properly. Studies have shown that the probability of such an accidental release occurring, the probability of it occurring where a person or property could be affected, and the possibility of injury to a person or damage to property on the ground are so small that the risk associated with the occurrence can be essentially discounted (ACC 1999). Lasers are not explosives, and lasers are employed by currently training aircraft at MHRC to provide very accurate targeting of ordnance. Lasers can be set in eye-safe mode for training such as urban combat. Existing range targets used for training with lasers not set in eye-safe mode are specifically cleared for such training and treated as inert munitions ranges. MHRC has targets designated for laser targeting systems, which are currently used by A-10 and other military aircraft.

BO 3.4.1.2 Base Environmental Consequences

Ground Safety

There are no aspects of various F-35A aircraft basing scenarios for Boise AGS that are expected to create new or unique ground safety issues. Operations and maintenance procedures conducted by base personnel would not change from current conditions. All activities would continue to be conducted in accordance with applicable regulations, technical orders, and AFOSH standards.

The project area does not fall within an established Q-D arc, and F-35A-related construction, renovation, and infrastructure improvement projects would be consistent with established Q-D arcs. Therefore, construction activity and subsequent operations would not result in any greater safety risk.

Ordnance used by the F-35A would be similar to that associated with current aircraft based at Boise AGS. Ordnance is handled and stored in accordance with Air Force and DDESB explosive safety directives, and all ordnance handling is carried out by trained, qualified personnel. Ordnance and laser training would use approved targets, including targets on MHRC, and such training would be comparable to existing ordnance and laser training.

Therefore, munitions handling, ordnance use, or laser training would not result in any greater safety risk, and no significant impact related to explosives or laser training safety would occur.

All renovation and construction activities would comply with all applicable OSHA regulations to protect workers. In addition, the newly constructed buildings would be built in compliance with AT/FP requirements. The Air Force does not anticipate any significant safety impacts as a result of construction, demolition, or renovation if all applicable AFOSH and OSHA requirements are implemented.

Airfield Safety

Boise Air Terminal Airport is expected to accommodate a steadily increasing number of civilian aircraft operations that are not related to the beddown of the F-35A training aircraft. Table BO 2.1–1 shows the expected number of civilian aircraft operations in 2017, when it is assumed the F-35A beddown would be complete. Even with the maximum number of aircraft based at Boise Air Terminal Airport, the F-35A would make up only 15 percent of the total operations at the airfield and not result in impacts on airfield safety.

BO 3.4.2 Airspace

BO 3.4.2.1 Airspace Affected Environment

Aircraft Mishaps. 124 FW has historically operated A-10 and C-130 aircraft. Since entering the Air Force inventory, these aircraft have demonstrated a Class A mishap rate per 100,000 flight hours of 2.14 and 0.859, respectively (see Table BO 3.4–1). The F-22 has not yet flown 100,000 flight hours to establish an official Class A mishap rate; therefore, an estimated rate based on the number of flight hours to date is presented in Table BO 3.4–1. The F-35A also does not have enough flight hours to estimate a Class A mishap rate.

Table BO 3.4–1. Class A Accident History

Aircraft	*Reporting Period*	*Accident Rate per 100,000 Hours*	*Lifetime Hours Flown*
C-130[1]	CY55–FY09	0.85	17,848,240
A-10	CY72–FY09	2.14	4,764,884
F-22[2]	FY02–FY09	8.59	69,844

[1] C-130 aircraft relocated from Boise Air Terminal Airport.
[2] Based on actual hours; the F-22 has not reached 100,000 flight hours as of the date of this publication.
Source: AFSC 2010a.

Bird/Wildlife–Aircraft Strike Hazards (BASH). Bird–aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local human populations if an aircraft crash occurs in a populated area. Aircraft may encounter birds at altitudes of 30,000 feet MSL or higher. However, most birds fly close to the ground. Over 94 percent of reported bird strikes occur below 3,000 feet AGL. Approximately 50 percent of bird strikes happen in the airport environment, and almost 15 percent occur during low-altitude flight training and use of weapons ranges (AFSC 2010b).

Migratory waterfowl (e.g., ducks, geese, and swans) are the most hazardous birds to low-flying aircraft because of their size and their propensity for migrating in large flocks at a variety of elevations and times of day. Waterfowl vary considerably in size from 1 to 2 pounds for ducks, 5 to 8 pounds for geese, and up to 20 pounds for most swans. There are two normal migratory seasons, fall and spring. Waterfowl are usually only a hazard during migratory seasons. These birds typically migrate at night and generally fly between 1,500 and 3,000 feet AGL during the fall migration and between 1,000 and 3,000 feet AGL during the spring migration.

Along with waterfowl, raptors, shorebirds, gulls, herons, and songbirds also pose a hazard. In considering severity, the results of bird–aircraft strikes in Restricted Areas show that strikes involving raptors result in the majority of Class A and Class B mishaps related to bird–aircraft strikes. Raptors of greatest concern are vultures and red-tailed hawks. Peak migration periods for raptors, especially eagles, are from October to mid-December and from mid-January to the beginning of March. In general, flights above 1,500 feet AGL would be above most migrating and wintering raptors. Songbirds are small birds, usually less than 1 pound. During nocturnal migration periods, they navigate along major rivers, typically between 500 and 3,000 feet AGL. The potential for bird–aircraft strikes is greatest in areas used as migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open-water bodies, rivers, and wetlands).

While any bird–aircraft strike has the potential to be serious, many result in little or no damage to the aircraft, and only a minute portion result in a Class A mishap. From FY1985 to FY2009, the Air Force BASH Team documented 86,189 bird strikes worldwide. Of these, 43 resulted in Class A mishaps in which aircraft was destroyed. These occurrences constituted approximately 0.05 percent of all reported bird–aircraft strikes (AFSC 2010b).

The Air Force BASH Team has 15 bird/wildlife–aircraft strikes recorded from 124 FW in its database for the period between 1995 and 2004. Reported strikes occurred in the airfield environment, on low-level missions, and en route, with few recorded from unknown areas. Strikes to 124 FW aircraft involved horned larks, Swainson's hawks, white-throated swifts, an American kestrel, a vesper sparrow, and a rufous hummingbird. There are concerns with a variety of species in the local airfield environment and in the surrounding areas where 124 FW operates. The local situation changes throughout the year, with migrant birds such as waterfowl, gulls, shorebirds, raptors, crows, doves, swallows, starlings, and blackbirds posing the most potential problems during both migration periods, while resident species cause hazards throughout the year. Additionally, there are concerns with several mammal species, including rodents, lagomorphs, and predators, causing potential hazards on the airfield and Gowen Assault Strip.

Much of the airfield is covered in turf, but a variety of conditions cause extensive bare areas on the field. Weedy patches, limited wetland areas, and surrounding features are also potentially attractive to a variety of bird and other wildlife species. Notable are extensive areas of the Gowen Assault Strip that contain sagebrush and weedy vegetation. Trees are limited on the airport and are mostly ornamental in nature, but provide perching and roosting sites for a variety of species. There are also several ditches where emergent vegetation and brush are present, and these habitat features may attract a variety of birds and other wildlife.

The area surrounding the installation also contains numerous features that are inherently attractive to a variety of birds and other wildlife potentially hazardous to nearby flying operations. Water features including the Boise River, Owyhee River, New York Canal, and Ridenbaugh Canal attract waterfowl, shorebirds, blackbirds, and other species. Extensive sagebrush habitat harbors large populations of ground squirrels and other rodents that, in turn, attract a wide variety of raptors. Golf courses and parks attract resident and migratory geese and other species. Industrial and urban areas provide habitat for rock doves (domestic pigeons), European starlings, and other species. Nearby lakes such as Lucky Peak Reservoir and Arrow Rock Reservoir to the east and Lake Lowell to the west attract numerous species of waterfowl, gulls, raptors, and others in the vicinity of Boise AGS.

Auxiliary Airfield

Mountain Home AFB. The close proximity of Mountain Home AFB (33 miles southeast of Boise AGS) provides 124 FW with an alternate airfield for practice runway operations. The airfield at Mountain Home AFB has one runway (12/30) with instrument approach and departure procedures established for both runway directions. Radar ATC services for the terminal airspace surrounding the base are provided by the Air Force–operated RAPCON facility. The Mountain Home AFB control tower is responsible for airfield operations within the Class D airspace surrounding the airfield (5-mile radius from the surface to 2,500 feet AGL).

BO 3.4.2.2 Airspace Environmental Consequences

Aircraft Mishaps. The Class A rate is not yet determined for the F-35A, and as with any new aircraft, there are always elements of a new system that require testing and evaluation. Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location. Although the F-35A is a relatively new type of aircraft, historical trends show that mishaps of all types decrease the longer an aircraft is operational as flight crews and maintenance personnel learn more about the aircraft's capabilities and limitations. As the F-35A becomes more operationally mature, the aircraft mishap rate is expected to become comparable with a similarly sized aircraft with a similar mission. The F-35A training aircraft proposed to be stationed at Boise AGS would operate in a similar manner as military aircraft currently based at Boise AGS. The F-35A would use the existing airspace, including MOAs, ATCAAs, restricted airspace, and MTRs, under the same procedures as currently exist. This would not result in any increase in the safety risks associated with aircraft mishaps or any increase in the risks of occurrence of those mishaps.

The F-35A is capable of dumping fuel in emergency situations. The FAA sets requirements for when and how fuel dumping may occur. This instruction stipulates that fuel can only be dumped above a minimum altitude of 2,000 feet to improve its evaporation, and that a dumping aircraft must be separated from other air traffic by at least 5 miles. Air traffic controllers are also instructed to direct planes dumping fuel away from populated areas and over large bodies of water as much as possible. The same guidelines apply to military aircraft; air bases only permit fuel dumping in a specified area (FAA 2010c). In 2001, the EPA National Vehicle and Fuel Emissions Laboratory concluded, "Since fuel dumping is a rare event, and the fuel would likely be dispersed over a very large area, we believe its impact to the environment would not be serious" (EPA 2001).

The wake turbulence behind the aircraft makes most of the fuel released vaporize into a fine mist, which remains in the atmosphere until being broken down by the sun's energy into carbon dioxide and water. Studies of the behavior of dumped fuels have been conducted using kerosene, of which the Jet Propellant-8 fuel that powers the F-35A is a derivative (FAA 2009b). Only a minimal amount of the dumped kerosene actually reaches the ground. If a fuel dump is made at the minimum altitude of 4,921 feet, given a ground temperature of 59 °F and assuming that the air is still, it is calculated that 8 percent of the total fuel dumped will reach the ground. Assuming the aircraft is flying at the minimum speed of 300 miles per hour, this results in the ground being affected by 2.09 ounces of kerosene spread over an area of 1,000 cubic yards (FAA 2009b).

The above assumes total stillness of the air, which is highly unlikely. Even the slightest air movements make fuel evaporate almost entirely before it can reach the ground.

Flare Use. As described in Chapter 2, Section 2.4.5, and in Section BO 2.2.2, the F-35A would use MJU-61/B defensive flares. These flares are similar to the flare types used by legacy aircraft such as the F-15Es. Flares would only be used in airspace units approved for flare use and within authorized altitudes. For Boise AGS, flares are authorized in the Saylor Creek Range and Juniper Butte Range. Flares are also authorized in the MHRC airspace, excluding the area over the Duck Valley Reservation and in the Saddle A/B MOAs. The minimum release altitude in the MHRC airspace is 3,000 feet AGL. Flares typically burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flare burnout before a flare reaches the ground or water under the training airspace. Mountain Home AFB, which manages the MHRC, would also have the discretion to restrict flare use during high or extreme fire danger to minimize the risk of wildland fires. Air Force Instructions (AFIs) are issued for each base to establish restrictions on flare deployment. Typically, these AFIs designate airspace managers or range controllers with the responsibility to identify and publicize fire conditions and specify minimum altitudes for flare use. Fire category restrictions are established for the use of flares, and aircrews are responsible to know the fire code and associated restrictions. Aircrews are briefed on fire conditions prior to a mission, and, if in doubt, the AFIs specifically state an "aircrew will not dispense flares anywhere in the impact area or MOA without positive confirmation that flare use is authorized." Airspace managers or range controllers apply a decision matrix that takes into consideration the fire danger assigned by the U.S. Forest Service (USFS) to the forests, such as high, very high or extreme, fuel load on the ranges, recent rainfall, humidity, winds, etc. Based on fire danger conditions, use of flares in specific airspaces can change on a daily basis.

On extremely rare occasions (estimated at approximately 0.01 percent of flares dispensed), a flare may not ignite and would fall to the earth as a dud flare. In an extremely rare occasion, where a dud flare is found, it should not be moved, the location should be identified, and the Air Force base public affairs office or the local fire department should be contacted and provided with the dud flare location.

The residual materials for flares, including the MJU-61/B, are described in detail in Chapter 2, Section 2.4.5. All of the MJU-61/B residual flare materials that fall have surface area to weight ratios that would not produce any substantial impact when the residual flare material struck the ground. The largest item is the 0.975 inch × 0.975 inch × 0.5 inch plastic and spring igniter

device with a weight of approximately 0.33 ounces in the MJU-61/B flare. This igniter device would strike the ground with a momentum of 0.046 lb-sec, or approximately the same force as a small hailstone, which would be noticed if it struck a person, but would not be expected to bruise. Additionally, the likelihood of a strike is remote given the areal extent of the airspace, the population density beneath the airspace, and the proportion of time a person is expected to be outside. Therefore, no significant impacts on safety from flare residual materials are expected.

BASH. A BASH risk exists at Boise Air Terminal Airport and its vicinity due to resident and migratory bird species and other wildlife. Daily and seasonal bird movements create various hazardous conditions. To address the issues of bird–aircraft strikes, the Air Force has developed the Avian Hazard Advisory System to monitor bird activity and forecast bird strike risks. Using Next Generation Radar (NEXRAD) weather radars and models developed to predict bird movement, the Avian Hazard Advisory System is an online, near–real-time geographic information system (GIS) used for bird–aircraft strike risk flight planning across the contiguous United States and Alaska.

Additionally, as part of an overall strategy to reduce aircraft strike hazard risks, the Air Force has developed a Bird Avoidance Model using GIS technology as a key tool for analysis and correlation of bird habitat, migration, and breeding characteristics and is combined with key environmental and manmade geospatial data. The model was created to provide Air Force pilots and flight schedulers/planners with a tool for making informed decisions when selecting flight routes. The model was created in an effort to protect human lives, wildlife, and equipment during air operations. This information is integrated into required pilot briefings, which take place prior to any sortie.

124 FW has an ongoing BASH program. Information and assistance is freely shared between various ANG organizations, with the Boise Air Terminal Airport staff, and with the ATC staff. Airfield habitat management, bird control, removal of other wildlife, bird dispersal activities, and proper communications with the control tower have all occurred in the past and have served to significantly reduce the hazards at the airfield. The airport staff conducts habitat management on the airfield. Most of the bird dispersal and control efforts have also been conducted by airport staff, supplemented by ANG personnel as needed. Use of the Avian Hazard Advisory System, the Bird Avoidance Model, and pilot briefings prior to sorties would continue to identify avoidance areas and provide a method to minimize risks from bird–aircraft strikes in any new airspace regardless of the scenario selected.

Auxiliary Airfield

Mountain Home AFB. F-35A flight activities would take place in the existing airspace and airfield environment. No airspace modifications or modifications of the Mountain Home AFB Accident Potential Zone (APZ) or Clear Zone (CZ) would be required under any of the F-35A aircraft scenarios. As noted in Section BO 3.4.1.1, no live ordnance would be loaded or carried by F-35A aircraft at Boise AGS. The current practice of loading live ordnance at Mountain Home AFB for use on training ranges will continue. F-35A flights to Mountain Home AFB for live weapons loading would be infrequent (up to 108 per year under Scenario B3) to support one mission per student pilot equating to about two flights per week. This is less than

0.3 percent of the total 30,062 annual baseline sorties at Mountain Home AFB. This frequency of use represents a continuation of practices currently conducted by 124 FW. Flight safety and ground safety conditions would remain unchanged.

BO 3.5 Soils and Water

BO 3.5.1 Base

BO 3.5.1.1 Base Affected Environment

Soils

The general topography of Boise AGS is relatively flat and dominated by the western portion of the Snake River Plain, with an average elevation of 2,820 feet MSL. The topography slopes gently to the west. Earthmoving activities associated with Boise AGS development have altered much of the soil profiles to the extent that soil horizons do not concur with local soil surveys from adjacent off-base areas.

Soils underlying Boise AGS have been primarily mapped as Elija silt loam (NRCS 1980, 2010). The soils are formed on 2 to 4 percent gradient, silty alluvial terraces; are relatively well-drained; and have a moderate to low susceptibility to erosion by water or wind. Surface soils are typically composed of approximately 9 inches of brown stony silt loam. The substratum typically consists of brown loam, silty clay, and hardpans.

Water

Surface Water. Boise AGS is located in the Boise River Drainage Basin, which receives an average annual precipitation of approximately 11 inches. Five Mile Creek, which originates in the mountains 3 miles southeast of Boise AGS, is an intermittent stream that parallels the south side of Gowen Road and extends into vehicle parking areas at the extreme southern perimeter of the main installation. This creek, which is filled only during periods of heavy rainfall or snowmelt runoff, discharges into the New York Canal, approximately 1 mile downstream of the installation, which, in turn, eventually discharges into the Boise River. A second, smaller drainage extends into the northeastern portion of Boise AGS and traverses the north–central portion of the installation. None of these water bodies (Five Mile Creek, the smaller unnamed drainage, and the downstream surface waters) are used for human consumption; however, the Boise River is used for crop irrigation (Idaho ANG 1997).

With the exception of the two drainages described above, the only surface-water features present on Boise AGS are manmade and were constructed for the purpose of controlling runoff. This comprehensive drainage system comprises several tributary ditches that receive runoff from roadside swales; building outfalls; and the Boise Interagency Fire Center, located on the eastern end of the runway complex. These tributary ditches feed into the centralized, westerly flowing drainage ditch that exits the base beneath South Orchard Road (NGB 2007).

No jurisdictional wetlands have been identified on Boise AGS (NGB 2007).

Floodplains. According to Federal Emergency Management Agency floodplain maps, the southern perimeter of Boise AGS is located within the 100-year floodplain of Five Mile Creek. The floodplain encompasses a firing range located south of Gowen Road, as well as an area located immediately north of Gowen Road and west of Farman Street. The facilities in this area include wash racks, parking yards, and detention ponds; however, no buildings are present within the 100-year floodplain.

Groundwater. Groundwater includes the subsurface hydrologic resources of the physical environment and is predominantly a safe and reliable source of fresh water for the general population, especially those in areas of limited precipitation. Groundwater is commonly used for potable water consumption, agricultural irrigation, and industrial applications. Groundwater also plays an important part in the overall hydrologic cycle, and its properties are described in terms of depth to aquifer or water table, water quality, and surrounding geologic composition.

Groundwater resources beneath Boise AGS include a shallow aquifer, at a depth of 150 to 190 feet, and a deep aquifer, at a depth of 350 feet. The Boise River is the probable source of recharge for the deep aquifer. Irrigation activity is thought to be the primary recharge source for the shallow aquifer. Historically, the New York Canal was considered the recharge source for the shallow aquifer, and leakage from the canal formed an additional shallow aquifer at a depth of 15 to 30 feet. However, the canal is now lined and is no longer a groundwater recharge source.

BO 3.5.1.2 Base Environmental Consequences

Soils and Surface Water. Depending on the F-35A aircraft scenario chosen for Boise AGS (i.e., Scenario B1, B2, or B3), construction would disturb 36.5, 37.0, or 37.9 acres, respectively, most of which has been previously disturbed. Onsite soils have a moderate-to-low susceptibility to erosion by water or wind. Removal of existing pavement, grading, and excavations would expose soil to potential wind and water erosion, which, in turn, could result in sedimentation of nearby drainages, including the adjacent Five Mile Creek, a tributary of the Boise River. Sedimentation occurs when soil particles are suspended in surface runoff or wind and are deposited in streams or other water bodies. Construction and other ground-surface-disturbing activities can accelerate erosion by removing vegetation, compacting or disturbing the soil, changing natural drainage patterns, and covering the ground with impermeable surfaces (pavement, concrete, buildings). When the land surface is impermeable, storm water can no longer infiltrate, resulting in larger amounts of water that can move more quickly across a site and can carry larger amounts of sediment and other pollutants to streams and rivers.

Because more than 1 acre would be disturbed by construction, a National Pollutant Discharge Elimination System (NPDES) storm water permit would be required. Under the permit, Boise AGS must develop a construction Storm Water Pollution Prevention Plan (SWPPP) that describes BMPs to be implemented to eliminate or reduce sediment and non-storm-water discharges.

Surface erosion is best controlled by stabilization practices, such as seeding, mulching, surface roughing, and buffer strips, as well as minimizing the area disturbed and the duration of exposure to disturbance. In addition, erosion can be controlled by structural actions such as

construction of silt fences and straw bales, check dams, sediment traps, compost filter berms, and stabilized entrance and exit points to construction sites. With proper design and implementation of the SWPPP, impacts from erosion and offsite sedimentation would be negligible and significant impacts would not occur.

The main limitation of soils at Boise AGS, with respect to construction, would be localized areas of hardpan (i.e., caliche). Heavy machinery would be required for leveling or making shallow excavations for utilities. However, these soil limitations can be mitigated through standard engineering and modern construction techniques, such that significant impacts would not occur.

Floodplains. The implementation of any of the F-35A aircraft scenarios would not include construction or operation within the existing designated 100-year floodplain. In addition, the construction would not affect the designated 100-year floodplain; therefore, no flood-related impacts would occur.

Groundwater. The implementation of any of the F-35A aircraft scenarios would not include groundwater withdrawals; therefore, groundwater impacts would not occur.

BO 3.5.2 Airspace

BO 3.5.2.1 Airspace Affected Environment

The land beneath the training airspace is characterized by localized steep rocky slopes that are susceptible to rockfalls, which occur most frequently during early spring, when there is abundant moisture and repeated freezing and thawing. The rocks may freefall, slide, or tumble down slopes in an erratic manner. When a large number of rocks plummet downward at high velocity, it is called a rock avalanche. Rockfalls are caused by the loss of support from underneath or detachment from a larger rock mass. Ice wedging, root growth, or ground shaking, as well as a loss of support through erosion or chemical weathering, may start the fall. However, man's activities can also cause rocks to fall sooner than would occur naturally. Excavations into hills and mountainsides for highways and buildings frequently aggravate rockfalls. Other causes include vibration from passing trains, blasting, changes in groundwater conditions, and sonic booms (Colorado Geological Survey 2010).

BO 3.5.2.2 Airspace Environmental Consequences

Water Quality. F-35A pilots would not train with chaff. However, flares would be used as part of the Proposed Action, as described in Chapter 2, Section 2.4.5, Ordnance and Defensive Countermeasures. Each defensive flare consists of small pellets of highly flammable material that burn rapidly at extremely high temperatures. Flares provide a heat source, other than the aircraft's engine exhaust, to decoy heat-sensitive or heat-seeking targeting systems. The flare ignites upon ejection from the aircraft and burns completely within approximately 3.5 to 5 seconds, or approximately 400 to 500 feet from its release point (Air Force 1997a).

Toxicology studies on flare residual materials indicate that no chemical effects are expected for water resources, since the primary material in flares, magnesium, is not highly toxic. Pieces of plastic, Mylar, and/or paper fall to the earth with each bundle of flare deployed. Such materials

are inert and are not likely to adversely impact water quality. The probability of a dud flare hitting the ground is extremely low, at an estimated rate of 0.01 percent of flares deployed. In the unlikely event that an intact dud flare lands in a water body, such as a wetland, creek, pond, or lake, there would be minimal to no effects of the metallic magnesium from the flare on the water body. Magnesium is already a substantial natural component of the earth, and the amount from a flare would be comparably insignificant (Air Force 1997a). Due to the low concentrations of the flare residue and the low probability of flare residue coming in contact with water bodies, flare releases are not expected to cause significant water quality impacts.

Soils. Lichens and cyanobacteria are important components of soil crust communities in the intermountain western United States, especially in areas protected from domestic grazing, wildfire, and off-road vehicle activity. Their presence is critical for soil stability, as well as for the contribution of nitrogen to the ecosystem in a form available to higher plants. Soil crusts in general, and lichens and cyanobacteria in particular, tend to be very sensitive to human-related perturbation, including air pollution (St. Clair et al. 1993; Belnap et al. 2001). The Proposed Action would have a large carbon footprint, and the increased pollution could affect soil crusts, which play a key role in retaining soil moisture and reducing water loss. Such soil crust impacts would be unavoidable.

Rockfalls. Although not common, sonic booms can potentially cause rockfalls to occur in localized areas of steep rocky slopes. Rockfalls are potentially dangerous in areas where people and/or property reside immediately downslope. Such failures would occur along slopes that are already susceptible to failure by other natural and/or manmade factors, as previously described. Typically, slopes prone to rockfalls in developed areas, such as along highway road cuts, have been engineered with protective devices, including wire netting and impact walls. As a result, slope failure reactivation by sonic booms would not be outside the norm for any given slope, such that significant impacts would not occur.

No other ground disturbance would occur in association with airspace operations; therefore, no additional impacts would occur with respect to soil and water.

BO 3.6 Vegetation and Wildlife

BO 3.6.1 Base

BO 3.6.1.1 Base Affected Environment

Vegetation

Boise AGS is located on the western arm of the Snake River Plain. In pre-settlement times, land that now encompasses Boise AGS supported relatively continuous expanses of open sagebrush-steppe native vegetation. These plant communities were dominated by a mix of shrubs, the most prominent among them being Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*). Other common shrub species present in steppe communities included silver sagebrush (*A. cana*), big sagebrush (*A. tridentata*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). Combined with a diversity of perennial grasses and herbaceous plants, shrub-dominated communities provided habitat and food resources for a variety of wildlife

species. Scattered throughout this vegetative setting were small, isolated alkaline playas, known locally as "slickspots," supporting unique communities.

Decades of land use practices such as grazing, agricultural conversion of vegetation, nonnative plant species invasions, and human-modified fire regimes in the vicinity have greatly altered vegetation and wildlife communities in the project area. Notably, the introduction of invasive nonnative plant species over the past century has drastically altered the historic landscape in and around Boise AGS, as well as throughout much of the sagebrush-steppe ecoregion. In most areas, shrub-steppe communities are undergoing a slow conversion to dominance by introduced annual forbs and grasses.

The majority of the Boise AGS land and vicinity to the north has been converted to a fragmented landscape of development for airport and residential/commercial uses, respectively. Boise AGS contains ruderal areas dominated by nonnative species that initially invaded during ground-disturbing activities associated with airport infrastructure development for buildings, roads, parking areas, and other facilities. Current unmanaged vegetation areas consist of mixed communities dominated by sagebrush or rabbitbrush with a depleted herbaceous understory composed primarily of nonnative annual grasses and occasional slickspots. Species present are typical of disturbed shrub-steppe communities throughout the western Snake River Plain.

Wildlife

Much of the area within Boise AGS has been developed or modified that it supports a diminished quality of habitat for wildlife and has a reduced likelihood of wildlife being present. South of Boise AGS, much open land exists, but the airport facilities and CZs are managed to keep vegetation controlled and the presence of wildlife, such as rodents, down, so as not to attract predators, such as raptors, that pose a collision threat to aircraft. Terrestrial wildlife species that inhabit the vicinity of Boise AGS consist of common, widespread species, several of which are typically associated with disturbed shrub habitats and tolerant of human presence, development, noise, and pollutants. These species include western fence lizards (*Sceloporus occidentalis*), side-blotched lizards (*Uta stansburiana)*, gopher snakes (*Pituophis catenifer*), ground squirrels (*Sciuridae*), black-tailed jackrabbits (*Lepus californicus*), American badgers (*Taxidea taxus*), striped skunks (*Mephitis mephitis*), house sparrows (*Passer domesticus*), western meadowlarks (*Sturnella neglecta*), European starlings (*Sturnus vulgaris*), Brewer's blackbirds (*Euphagus cyanocephalus*), and rock doves (*Columbia livia*). Transient use by other wide-ranging wildlife species with similar ecological requirements is likely. Some specific bird–aircraft strike occurrences have been identified through BASH reports and are discussed in Section BO 3.4.

BO 3.6.1.2 Base Environmental Consequences

Construction

For the beddown of F-35A aircraft at Boise AGS, a minimum of 36.5 acres under Scenario B1 (addition of 24 aircraft) and a maximum of 37.9 acres under Scenario B3 (addition of 72 aircraft) of land would be affected by demolition, renovation, construction, and infrastructure improvements on the base. For all land disturbance calculations, 10 percent was added outside of the project footprints to account for temporary land disturbance likely to occur for equipment

access and laydown areas. Planned construction would be confined to previously developed and disturbed areas of Boise AGS.

For construction and demolition activities in developed portions of Boise AGS, no long-term effects on vegetation and wildlife are anticipated. During demolition and construction activities on Boise AGS, the amount of noise and dust generated is expected to increase during working hours, although normal precautions would be taken to minimize these effects (see Section BO 3.2, Noise, and BO 3.3, Air Quality). Additionally, measures to control erosion and siltation would be included as part of the project implementation. Revegetation of temporarily disturbed areas would be conducted as directed by the base to minimize the potential for continued erosion and dust generation and decrease the duration of temporary habitat loss. To comply with the Migratory Bird Treaty Act and the DoD Bat Protection Memorandum of Understanding and to assure no habitation by nesting birds or sensitive bat species abandoned buildings would be surveyed for these species before their demolition and removal. Because areas proposed for construction on Boise AGS have already largely been disturbed, no significant adverse effects of construction on vegetation or wildlife are expected.

Operations

No effects on vegetation are expected from F-35A operations in the vicinity of Boise AGS. Wildlife species on and near Boise AGS exist in an airfield environment, which includes regular takeoffs, landings, and low-level overflights by military and civilian aircraft. The F-35A aircraft would employ similar departure, closed patterns, and landing procedures as those currently used by Boise AGS aircraft. F-35A operations would adhere to existing restrictions and avoidance procedures. The noise levels associated with the F-35A aircraft vary considerably, according to the actual flight profile. Noise levels expected as a result of implementing the F-35A aircraft scenarios would be qualitatively similar to the existing noise environment. Wildlife species in the vicinity of Boise AGS live in a military airfield environment and would not be expected to be adversely affected by changes in aircraft overflight and noise associated with transitioning to the F-35A aircraft.

BO 3.6.2 Airspace

BO 3.6.2.1 Airspace Affected Environment

Vegetation

As shown in Figure BO 2.2–1, airspace units for F-35A training overlie more than 20 million acres of land covering portions of five states. This airspace primarily occurs over the Intermountain Semidesert Province/Sagebrush Steppe ecoregion of southwestern Idaho, northern Nevada, and eastern Oregon (Bailey 1995), with much smaller areas over portions of Montana and Utah. Table BO 3.6–1 lists the vegetation or land cover types that occur under the project airspace, acreage, and percentage of the land overlain by the airspace covered by each type.

Shrublands. Shrubland habitats, which in this region include semidesert, sagebrush steppe, scablands, chaparral, and scrub oak-dominated areas, dominate the ground surface under the airspace and cover approximately 62 million acres (65 percent) of the Boise AGS airspace (see Table BO 3.6–1).

Among the shrublands under the project airspace, sagebrush steppe dominated by big sagebrush is the most extensive rangeland cover type. Co-dominant vegetation includes shadscale (*Atriplex confertifolia*) mixed with short perennial grasses such as Sandberg's bluegrass (*Poa sandbergii*) and squirreltail (*Sitanion hystrix*) (Air Force 1992; Bailey 1995). These habitats are primarily used for livestock grazing. Woodlands may be present as "islands" within the shrubland steppe. On higher-elevation slopes, shrublands may include mountain sagebrush (*A. t. vaseyana*) and evergreen species, such as curlleaf mountain-mahogany (*Cercocarpus ledifolius*).

Table BO 3.6–1. Vegetation/Land Cover Types Under Boise AGS Primary Use Airspace

Vegetation/Land Cover Classification	*Acres Under the Airspace*[1]	*Percentage of the Total Area Under Airspace*
Shrublands (semidesert, sagebrush steppe, scabland, scrub oak)	61,809,477	65
Forests and Woodlands		
Coniferous Forest and Woodlands	17,124,929	18
Deciduous Woodlands	1,597,239	2
Grasslands (lowland, prairie, montane, and alpine)	5,450,937	6
Barren and Sparse (cliff, bluff, canyon, badland, playa)	2,843,630	3
Agriculture	1,396,392	1
Introduced vegetation	2,473,874	3
Developed, including mining	215,842	< 1
Riparian	1,722,728	2
Wetlands	503,036	1
Open Water	156,036	< 1
Total	**95,294,120**	**100**

Forests and Woodlands. Compared with the extensive shrubland, the area under the airspace includes a relatively small area of higher-elevation habitats that can support forests and other woody vegetation types. Coniferous forests and woodlands cover approximately 17 million acres (18 percent of the ROI), with deciduous woodlands occurring on an additional 1.6 million acres (2 percent) of the land under the airspace. Predominant coniferous trees found in the region include Douglas fir (*Pseudotsuga mensiesii*) and ponderosa pine (*Pinus ponderosa*). Woodlands in the project ROI are dominated by Utah juniper (*Juniper osteosperma*) and western juniper (*J. occidentalis*) in scattered dense or open patches depending on soil conditions. Understory grasses are similar to those found in the sagebrush steppe. Deciduous woodlands occur at higher elevations where moisture is more reliable to support western hackberry (*Celtis reticulata*), narrowleaf cottonwood (*Populus angustifolia*), and quaking aspen (*P. tremuloides*).

Grasslands. Grasslands, which occur from lowlands and prairies up into montane and alpine areas, occur on approximately 5 million acres (6 percent) of the ROI. The shrublands and grasslands in the region can be intermixed and are often located on public lands primarily utilized for livestock grazing during all seasons. Cattle and sheep are both grazed in large numbers, along with a small number of horses (Air Force 1992).

Barren and Sparse Areas. Barren and sparsely vegetated lands are present on approximately 3 million acres (3 percent) of low-elevation playas and badlands, as well as higher-elevation cliffs, bluffs, and canyons. These areas typically support little to no vegetation and little in the way of wildlife habitat except for specialized species such as bighorn sheep (*Ovis canadensis*).

Agriculture. Land used primarily for agricultural purposes was mapped as covering approximately 1.4 million acres (1 percent) under the airspace. The most successful farming in Idaho occurs in the western and central portions of the state, where irrigation water is available. Major crops grown in the region include potatoes, sugar beets, alfalfa, and grains. Idaho is also known for seed production; crops for which seed is grown include sweet corn, alfalfa, field and garden beans, Kentucky bluegrass, carrot, onion, turnip, and lettuce.

Introduced Vegetation. By the middle of the last century, nonnative plants were brought to the western United States to "improve" forage for livestock and to stabilize soil, and, in some cases, inadvertently with domestic animal introduction from another part of the world. Many of these nonnative plants became established quickly and outperform native vegetation because they have no plant pests. Areas influenced by the introduction of nonnative plants that were large enough to be mapped occur on 2.5 million acres (3 percent) of the ROI. These include areas that have been disturbed by past farming activities, range modifications, and/or fires. Subsequent to fire, invasion by cheatgrass (*Bromus tectorum*) and Medusa-head wildrye (*Elymus caput-medusae*) (Air Force 1992) has been a common occurrence and promotes repeated fires at short intervals, inhibiting the reestablishment of native shrubs. Post-fire restoration activities have included re-seeding with introduced perennial grass species such as crested wheatgrass (*Agropyron desertorum* and *A. cristatum*).

Developed Lands. Developed areas include those that are occupied by urban development, mining, and other human activities and occur on approximately 215,842 acres (less than 1 percent) of the ROI. Urban land cover is detailed in Section BO 3.10, Land Use.

Wetlands, riparian areas, and open water are discussed in Section BO 3.7, Wetlands and Aquatic Communities.

Wildlife

Because the area under the airspace is approximately 70 percent grasslands and shrublands, species that prefer open country are likely to range over most of the ROI. Raptors are common in these habitats and include red-tailed hawks (*Buteo jamaicensis*), Swainson's hawks (*Buteo swainsoni*), American kestrels (*Falco sparverius*), prairie falcons (*Falco mexicanus*), ferruginous hawks (*Buteo regalis*), and golden eagles (*Aquila chrysaetos*). These birds prey on the numerous rodent and rabbit species in the region. Townsend's ground squirrels (*Spermophilus townsendi*) and black-tailed jackrabbits are particularly important as prey (Air Force 1992).

Many shrubland and grassland songbirds are common in habitat within the ROI. Common birds include sage sparrows (*Amphispiza belli*), sage thrashers, and Brewer's sparrows (*Spizella breweri*), all of which rely on the presence of quality sagebrush habitat. Western meadowlarks (*Sturnella neglecta*), vesper sparrows (*Pooecetes gramineus*), and savannah sparrows (*Passerculus sandwichensis*) favor the grassland habitats. Upland game birds in the region include mourning dove (*Zenaida macroura*), mountain quail (*Oreortyx pictus*), and blue grouse (*Dendragapus obscurus*), along with introduced gamebird species such as chukar (*Alectoris chukar*), gray partridge (*Perdix perdix*), ring-necked pheasant (*Phasianus colchicus*), and California quail (*Callipepla californica*). A branch of the Pacific Migratory Bird Flyway runs through the airspace and large numbers of migratory birds pass through the area during the spring and fall. Where wetlands are present, many species of waterfowl and shorebirds take advantage of the stopover and resting habitat. Many of the medium- to small-sized mammals and reptiles listed as occurring on Boise AGS occur with more regularity outside of developed, human-dominated areas.

The most common ungulates in the region are the pronghorn (*Antilocapra americana*), which occur on lower-elevation flat grasslands, and mule deer (*Odocoileus hemionus*), which utilize tall and dense vegetative cover in drainages and continue into forest edges. Other species that occur in coniferous forests under the airspace include black bear (*Ursus americanus*) and mountain lion (*Felis concolor*) where suitable denning and foraging/hunting opportunities for these species exist. Elk (*Cervus elaphus*) inhabit mountain meadows in summer and lower elevations in winter. Birds that occur from the woodlands into the forests include American crows (*Corvus brachyrhynchos*), black-billed magpies (*Pica pica*), Hammond's flycatcher (*Empidonax hammondii*), Swainson's thrush (*Catharus ustulatus*), pine siskin (*Carduelis pinus*), western wood-pewee (*Contopus sordidulus*), Lewis' woodpecker, Townsend's solitaire (*Myadestes townsendi*), and spotted towhee (*Pipilo maculatus*).

Bighorn sheep *(Ovis canadensis*) were one of the most abundant game animals at the beginning of the 19th century in southwestern Idaho, but hunting by miners and settlers, range exploitation by domestic livestock, and diseases transmitted by livestock led to precipitous population declines (Air Force 1992). Bighorn sheep were extirpated from much of the area by 1916. The IDFG began a reintroduction program to reestablish bighorn sheep in their former habitats within the state in 1963 along with efforts in Oregon and Nevada (Air Force 1992). The population in southwestern Idaho was about 1,200 individuals in 2005, with more inhabiting the Owyhee River Canyon in Oregon (IDFG 2005). This herd is hunted on a carefully controlled, one-in-a-lifetime permit basis. In this region, bighorn sheep inhabit rugged terrain consisting of river canyons and usually remain within 3 miles of water. This species moves onto adjacent plateaus and meadows to forage and to lamb.

Auxiliary Airfield

Mountain Home AFB. Mountain Home AFB is located approximately 40 miles from Boise AGS. The majority of the 5,825-acre (excluding the Small Arms Range) Mountain Home AFB is developed and consists of landscaped areas, buildings, landfills, rubble piles, and paved areas (Air Force 2001). In general, open areas are either landscaped or dominated by introduced weedy species such as cheatgrass. Native habitats, primarily disturbed, constitute less than 7 percent of Mountain Home AFB's total area. The most common habitat type characteristic of the base area, besides being disturbed and weed-dominated, is sagebrush steppe with wildlife

inhabitants similar to those listed in Section BO 3.6.1 for the Boise AGS area. Even though it is located in a generally rural area, Mountain Home AFB experiences enough use that the wildlife species in the area are habituated to air and ground traffic and other human disturbances in general.

BO 3.6.2.2 Airspace Environmental Consequences

Operations impacts on biological resources from the F-35A aircraft scenarios could result from low-level overflights and associated noise, sonic booms, munitions use and the use of flares, and bird–aircraft collisions. A comprehensive review of current literature evaluating potential effects on wildlife and habitat from overflight, noise, and sonic booms is presented in Appendix B.

Low-Level Overflight and Noise. All airspace units that would be used for F-35A training are currently used as active military airspace by military jet aircraft, including A-10s and F-15s; therefore, wildlife in these areas have previous exposure to military jet overflight, including low-level overflight and noise, sonic booms, and use of munitions and defensive countermeasures that would be associated with introducing the F-35A aircraft and will be analyzed in this section. The sudden visual appearance of the aircraft and onset of noise from a low-level overflight has the potential to startle wildlife. Both the visual appearance and noise levels of aircraft diminish rapidly with increasing altitude.

Unlike the A-10 aircraft, which regularly use the airspace and MTRs, no F-35A low-level flight training is expected to occur below 500 feet AGL. Most of the F-35A training would occur at altitudes exceeding 10,000 feet AGL, with approximately 3 percent of training time projected to occur between 500 feet AGL and 2,000 feet AGL. Table BO 2.2–3 provides a comparison of percentages of flight hours at different altitudes between A-10 and F-15 aircraft currently using the airspace and proposed F-35A use. For A-10 aircraft, 96 percent of flight hours are spent below 10,000 feet AGL, whereas for F-35A aircraft, 85 percent of flight hours would be spent above 10,000 feet AGL. F-15s, which also currently use the airspace, also fly at lower altitudes than those projected for F-35As, with 42 percent of total F-15 flight hours spent below 10,000 feet AGL.

At the altitudes where the F-35A would spend most of its time, overflight noise (as perceived from the ground) would increase relatively gradually from ambient to the peak noise level. Overflight events at these altitudes would not be expected to be startling to animals or to have other adverse impacts. Based on (1) the very low percentage of time spent in low-level flight by F-35As training within the airspace and (2) the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, no significant adverse effects on vegetation or wildlife from overflights or noise are anticipated to be associated with the addition of F-35A training.

Sonic Booms. The sound of a sonic boom can be like thunder: either a sharp double clap if the aircraft is directly overhead or a distant rumble if the aircraft is at a distance. The intensity of the boom (overpressure) at the Earth's surface decreases with an increase in the altitude at which the aircraft goes supersonic. Overall, studies of wildlife and domestic animals have demonstrated that behavioral responses are of short duration and rarely result in injury or negative population effects (Krausman et al. 1998; Weisenberger et al. 1996). Habituation to

more-frequent sonic booms may also occur (e.g., Ellis et al. 1991; Workman et al. 1992). Habituation to thunderclaps and rumble associated with seasonally frequent thunderstorms within the ROI is also expected to minimize the response of birds, mammals, and domestic animals to sonic booms.

Supersonic flight in the Jarbidge and Owyhee MOAs and in R-3202 and R-3204 is not permitted at altitudes below 10,000 feet AGL and supersonic flight is not permitted at any altitude in the Saddle MOA or on MTRs. Sonic booms produced by the F-35A aircraft have characteristics similar to those produced by the F-16 aircraft that used the airspace until recently. F-35A sonic boom overpressures are slightly lower than overpressures generated by the F-15 aircraft currently based at Mountain Home AFB. Proposed F-35A training in the Jarbidge MOAs would slightly increase the average number of booms per day at any given location near the center of the airspace from 2.0 under baseline conditions to 2.1 under Scenario B1, 2.2 under Scenario B2, and 2.4 under Scenario B3. A similar trend would be observed beneath the Owyhee MOAs, with the average number of sonic booms per day increasing from 1.9 under baseline conditions to 2.0 under Scenario B1, 2.1 under Scenario B2, and 2.2 under Scenario B3. The number of sonic booms experienced per day beneath the Saddle MOA would not increase under any of the scenarios. Based on the fact that sonic booms and seasonally frequent thunderclaps currently exist in the training airspace, all supersonic flights would take place at altitudes above 10,000 feet AGL, and that free-ranging wildlife have generally minimal responses to sonic booms, it is not expected that the projected incremental increase in sonic booms associated with F-35A training would result in a significant impact on wildlife.

Munitions Use and Defensive Countermeasures. All ranges for the use of live and inert munitions by F-35A training currently support munitions use. Munitions use is restricted to specific designated target areas on ranges within the Jarbidge MOA (Juniper Butte and Saylor Creek), which are maintained in a mowed or bladed (bare ground) condition to minimize fire hazard. Target areas would not likely attract wildlife species because of limited habitat and resource availability.

In contrast to most other military jet aircraft, the F-35A would not deploy chaff as a defensive countermeasure against radar-guided missiles. It would deploy defensive flares to counter heat-seeking missiles, as do most other military jet aircraft. Residual materials from a deployed flare likely to reach the ground are listed in Table 2–11 and include a small square piece of plastic or nylon, a small square piece of silicon foam, a plastic spring device, and a strip of graphite material similar to duct tape. Should one of these items be encountered by a wild or domestic animal, the animal is not expected to consume it or otherwise be affected by it. Generally, the duration of a flare burn is a few seconds and the flare burns out within a few hundred feet of its release altitude. In the event a flare were to reach the ground while still burning, it could ignite dry vegetation and start a wildland fire. Because of this, in fire-prone areas, special restrictions on flare use may be instituted to minimize the potential for a burning flare to reach the ground. Risks of starting a fire remain extremely small as long as the minimum altitude for flare deployment remains designated above 3,000 feet AGL and restrictions on flare use in extreme fire conditions continue to be established by a Command or base to further reduce fire risks. Flare use would be restricted to any authorized airspace where flare use is currently permitted. Restricting flare use to authorized airspace and altitudes reduces the potential for wildland fire ignition and spread. Shrub-steppe ecosystems

dominated by sagebrush can be adversely affected by wildland fire in areas where cheatgrass, an invasive nonnative annual grass, has invaded. This is because the grasses regenerate and can carry fire again within a year, whereas it takes many years for the sagebrush and some of the other dominant shrubs to regenerate from seed. In contrast, periodic wildland fire is a regular occurrence in native western grassland ecosystems, and the vegetation and wildlife species are well-adapted to periodic fire, having mechanisms to escape and survive fire and to regenerate after fire. It is unlikely that flare use associated with F-35A training would appreciably increase the incidence of wildland fires given measures in effect to reduce the potential for fire from flare use; therefore, impacts on vegetation and wildlife would be less than significant.

Bird–aircraft or other wildlife–aircraft collisions would occur infrequently and would not represent a substantial source of mortality for any species.

Auxiliary Airfield

Mountain Home AFB. No construction or other modification associated with F-35A training is expected at Mountain Home AFB. Existing annual airfield operations by military and civilian aircraft total 30,062 (see Table BO 2.2–4). Implementation of F-35A training would add between 37,153 and 51,259 airfield operations per year, depending upon the scenario, representing an increase of 23 to 71 percent above baseline levels. Due to Mountain Home AFB's long history as an airfield and its ongoing level of activity, wildlife species in the vicinity are not expected to be adversely affected by changes in aircraft overflight and noise associated with transitioning to the F-35A aircraft.

BO 3.7 Wetlands and Aquatic Communities

BO 3.7.1 Base

BO 3.7.1.1 Base Affected Environment

No wetlands have been identified on Boise AGS (NGB 2007; Fruhlinger 2011a). The channel of Five Mile Creek parallels the south side of Gowen Road and extends into vehicle parking areas at the extreme southern edge of the main installation. A second, smaller drainage extends into the northeastern portion of the base. Both drainages are intermittent streams that accumulate water from snow melt, heavy rains, and storm drainage but maintain no hydrologic connection to the Boise River and do not support riparian vegetation or wetlands (NGB 2007).

"Slickspots" exist in undeveloped areas as shallow, seasonally inundated alkaline depressions within uplands that have no surface hydrologic connection to waters of the United States and, therefore, are not considered jurisdictional wetlands.

BO 3.7.1.2 Base Environmental Consequences

No wetlands or aquatic habitats would be within the construction zones where they could be directly affected by construction. Measures to control erosion, siltation, and fugitive dust would be included as part of the project implementation, minimizing the potential for construction to indirectly affect offsite aquatic and wetland habitats and biota. No effects on aquatic and wetland habitats are expected from F-35A operations in the vicinity of Boise AGS.

BO 3.7.2 Airspace

BO 3.7.2.1 Airspace Affected Environment

Within the intermountain basin landscape beneath airspace associated with Boise AGS, wetlands are rare but of extremely high importance in supporting survival of resident and migratory wildlife. While the majority of this region is dominated by sagebrush-steppe vegetation, wetlands exist in the context of shallow depressions within uplands (playas). Additionally, wetlands exist as wet meadows, seeps, springs, and drainages associated with canyons flowing out of mountain ranges. Table BO 3.6–1 provides the total area of wetland and riparian areas mapped under the primary use airspace. Mapped wetlands cover 111,679 acres (1 percent) of lands under the airspace, and mapped riparian areas and floodplains cover 364,867 acres (2 percent). The predominant woody riparian species that occur along streams in and near the mountains are willows (*Salix* spp.), with understories of rushes (*Juncus* spp.) and sedges (*Carex* spp.). As streams flow farther from the mountains and into gradually sloping valley bottoms, soils become finer-textured and more alkali-affected, water availability diminishes, and greasewood (*Sarcobatus vermiculatus*) and other alkali-tolerant plants dominate.

Auxiliary Airfield

Mountain Home AFB. During 1990 and 1995 wetland surveys conducted on Mountain Home AFB, nine small playas, manmade storage lagoons, and drainage ditches were identified as potential wetlands but were not considered jurisdictional wetlands (Mountain Home AFB 2004).

BO 3.7.2.2 Airspace Environmental Consequences

No adverse effects on aquatic and wetland habitats are expected from F-35A training operations in project airspace. There is a very low probability that an unburned flare or material from a flare would reach an aquatic or wetland environment. Magnesium, the major chemical component of flares, is consumed as the flare burns, but can be toxic at extremely high levels, a situation that could occur only under repeated and concentrated use in localized areas, which would not occur because of the widely dispersed nature of flare deployment. No adverse effects on aquatic and wetland habitats are expected from F-35A training use of Mountain Home AFB as an auxiliary airfield because no ground disturbance would occur.

BO 3.8 Threatened, Endangered, and Special Status Species

The U.S. Fish and Wildlife Service (USFWS) maintains the list of species protected under the Endangered Species Act (ESA) (16 *United States Code* [U.S.C.] 1536). In addition, the IDFG compiles its own list of species considered threatened and endangered in Idaho.

BO 3.8.1 Base

BO 3.8.1.1 Base Affected Environment

Only one federally listed species, slickspot peppergrass (*Lepidium papilliferum*), is known to occur on Boise AGS. This plant was listed as threatened under the ESA in October 2009 (USFWS 2009). As of 2001, there were three known occurrences of the slickspot peppergrass present on Boise AGS (Boise 2001). A 2004 site survey identified the presence of slickspot peppergrass in one of 74 slickspots present on a parcel projected for development as the new munitions maintenance and storage area at that time (NGB 2007). The Idaho National Guard (Fruhlinger 2011b) identified slickspot peppergrass at three locations on undeveloped land south of Gowen Field. Critical habitat proposed for slickspot peppergrass on May 10, 2011 (USFWS 2011), includes an undeveloped portion of Boise International Airport property south of Gowen Field, where the plants mentioned above have been identified. No other known federally listed, proposed, or candidate threatened or endangered species are known or likely to occur on Boise AGS. Urban development, continuous human presence, vehicle and equipment noises, and efforts to keep vegetation controlled and wildlife away from flight areas have diminished the quality of the installation lands to support native plant species and, therefore, the availability of quality wildlife habitats that may attract or support sensitive species.

BO 3.8.1.2 Base Environmental Consequences

Because the construction areas on Boise AGS are located in previously disturbed areas, no significant impacts on federally listed slickspot peppergrass or other sensitive species that may occur on base are expected to result from construction of project facilities. Siting of facilities will be conducted to avoid direct or indirect impacts on slickspot peppergrass or its critical habitat, given its proximity to the airfield. Impacts on the species and its proposed critical habitat would therefore be less than significant and would be consistent with a "may affect, not likely to adversely affect" finding under the ESA. No other known federally listed threatened or endangered wildlife species or their habitats occur on Boise AGS; therefore, no adverse effects on federally listed wildlife are anticipated from implementation of the F-35A aircraft scenarios at Boise AGS. Should state species of concern be detected at Boise AGS where construction would occur, appropriate consultation with the IDFG would be undertaken and measures to avoid potential adverse impacts on the species would be conducted.

No significant impacts from airfield operations would be expected on special status wildlife that may occur on base due to the qualitatively similar nature of F-35A operations to current and historical operations associated with the existing military airfield environment at Boise AGS.

BO 3.8.2 Airspace

BO 3.8.2.1 Airspace Affected Environment

As part of the environmental impact analysis process for this project, USFWS and the IDFG were contacted for information on species of concern in the project ROI, which includes airspace. Table BO 3.8–1 presents the federally listed and candidate animal and plant species that may occur within the counties of the five states that underlie the project airspace MOAs and where ranges occur.

Species that occur under the project primary use airspace identified in Table BO 3.8–1 have been exposed to past and ongoing military overflights similar to those being proposed for this project. Comprehensive reviews of threatened, endangered, and other special status species and communities that may occur under most of the airspace associated with Boise AGS were included in the *Initial F-22 Operational Wing Beddown Environmental Impact Statement* (Air Force 2001) and in the *Paradise East and Paradise West MOAs Environmental Assessment* (Air Force 2009a). Use of other ("occasional use") airspace by F-35A is expected to be incidental and minor compared to the proposed use of primary use airspace by F-35A identified in Table BO 3.8–1, and occasional use airspace is not evaluated further in this document.

Table BO 3.8–1. Federally Listed, Proposed, and Candidate Species Known or Likely to Occur Under Primary Use Airspace and on Ranges

Common Name (Scientific Name)	***Federal Status***	***Idaho Counties***															***Oregon Counties***							***Nevada Counties***		***Utah County***	***Montana Counties***	
		Elmore	**Owyhee**	**Twin Falls[1]**	**Cassia**	**Power**	**Blaine**	**Butte**	**Custer**	**Camas**	**Boise**	**Valley**	**Lemhi**	**Idaho**	**Adams**	**Washington**	**Baker**	**Grant**	**Harney**	**Malheur**	**Crook**	**Deschutes**	**Lake**	**Elko**	**Humboldt**	**Box Elder**	**Ravalli**	**Beaverhead**
Gray wolf (*Canis lupus*) Population west of Oregon Highways 395/78/95[2]	E, E/NE																	X	X	X	X	X	X					
Grizzly bear *(Ursus acrtos horribilis)*	T													X													X	X
Canada lynx *(Lynx Canadensis)*	T	X					X	X	X	X	X	X	X	X	X												X	X
Northern Idaho ground squirrel *(Spermophilus brunneus brunneus)*	T											X			X	X												
Southern Idaho ground squirrel *(Spermophilus brunneus endemicus)*	C														X	X												
Northern spotted owl[3] *(Strix occidentalis caurina)*	E																					X●						
Greater sage-grouse *(Centrocercus europhasianus)*	C	X	X	X													X	X	X	X	X	X	X	X	X			
Yellow-billed cuckoo *(Coccyzus americanus)* Western U.S. Distinct Population Segment	C				X	X	X												X	X		X		X				

Common Name (Scientific Name)	**Federal Status**	***Idaho Counties***															***Oregon Counties***							***Nevada Counties***		***Utah County***	***Montana Counties***	
		Elmore	**Owyhee**	**Twin Falls[1]**	**Cassia**	**Power**	**Blaine**	**Butte**	**Custer**	**Camas**	**Boise**	**Valley**	**Lemhi**	**Idaho**	**Adams**	**Washington**	**Baker**	**Grant**	**Harney**	**Malheur**	**Crook**	**Deschutes**	**Lake**	**Elko**	**Humboldt**	**Box Elder**	**Ravalli**	**Beaverhead**
Whooping crane *(Grus Americana)* transient	E																										X	X
Columbia spotted frog *(Rana luteiventris)* Great Basin Distinct Population Segment	C		X	X													X	X	X	X	X		X	X	X			
Oregon spotted frog *(Rana pretiosa)*	C																					X						
Bull trout *(Salvelinus confluentus)*	T	X	X				X	X	X	X	X	X	X	X	X●	X●	X ●	X●	X	X●	X●	X●	X ●	X			X	
Lahontan cutthroat trout *(Oncorhynchus clarkii henshawi)*	T																		X	X				X	X			
Steelhead trout (*Oncorhynchus mykiss gairdneri)* Snake River Basin	T						X●		X●			X●	X●	X●	X●													
Chinook salmon (*Oncorhynchus tshawytscha)* Snake River spring/summer-run	T						X●		X●			X●	X●	X●	X●													
Chinook salmon (*Oncorhynchus tshawytscha)* Snake River fall-run	T													X●	X●													

Common Name (Scientific Name)	***Federal Status***	***Idaho Counties***															***Oregon Counties***							***Nevada Counties***		***Utah County***	***Montana Counties***	
		Elmore	**Owyhee**	**Twin Falls[1]**	**Cassia**	**Power**	**Blaine**	**Butte**	**Custer**	**Camas**	**Boise**	**Valley**	**Lemhi**	**Idaho**	**Adams**	**Washington**	**Baker**	**Grant**	**Harney**	**Malheur**	**Crook**	**Deschutes**	**Lake**	**Elko**	**Humboldt**	**Box Elder**	**Ravalli**	**Beaverhead**
Sockeye salmon (*Oncorhynchus nerka)* Snake River	E						X●		X●				X●	X●														
Clover Valley speckled dace *(Rhinichthys osculus oligoporus)*	E																							X				
Independence Valley speckled dace *(Rhinichthys osculus lethoporus)*	E																							X				
Desert dace *(Eremichthys acros)*	T																								X ●			
Foskett speckled dace (*Rhinichthys osculus* ssp.*)*	T																						X					
Modoc sucker (*Catostomus microps)*	E																						X ●					
Warner sucker (*Catostomus warnerensis)*	T																						X ●					
Shortnose sucker (*Chasmistes brevirostris)*	E																						X ●					
Hutton tui chub (*Gila bicolor* ssp.*)*	T																						X					
Borax Lake chub *(Gila boraxobius)*	E																		X●									
Utah valvata snail *(Valvata utahensis)*	E			X	X	X	X			X																		

Common Name (Scientific Name)	Federal Status	Idaho Counties															Oregon Counties							Nevada Counties		Utah County	Montana Counties	
		Elmore	Owyhee	Twin Falls[1]	Cassia	Power	Blaine	Butte	Custer	Camas	Boise	Valley	Lemhi	Idaho	Adams	Washington	Baker	Grant	Harney	Malheur	Crook	Deschutes	Lake	Elko	Humboldt	Box Elder	Ravalli	Beaverhead
Snake River physa snail *(Haitia (Physa) natricina)*	E	X	X	X	X																							
Bliss Rapids snail *(Taylorconcha serpenticola)*	T	X		X																								
Bruneau hot springsnail *(Pyrgulopsis bruneauensis)*	E		X																									
Elongate mud meadows springsnail *(Pyrgulopsis notidicola)*	C																								X			
Slickspot peppergrass *(Lepidium papilliferum)*	T	X	X																									
Goose Creek milkvetch *(Astragalus anserinus)*	C				X																			X				
Soldier Meadow cinquefoil *(Potentilla basaltica)*	C																								X			
Christ's paintbrush *(Castilleja christii)*	C				X																							
Malheur wire-lettuce *(Stephanomeria malheurensis)*	E																		X●									
Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis)*	T																X			X								

Common Name (Scientific Name)	Federal Status	Idaho Counties															Oregon Counties							Nevada Counties		Utah County	Montana Counties	
		Elmore	Owyhee	Twin Falls[1]	Cassia	Power	Blaine	Butte	Custer	Camas	Boise	Valley	Lemhi	Idaho	Adams	Washington	Baker	Grant	Harney	Malheur	Crook	Deschutes	Lake	Elko	Humboldt	Box Elder	Ravalli	Beaverhead
MacFarlane's four-o'clock *(Mirabilis macfarlanei)*	T													X														
Spalding's catchfly *(Sliene spaldingii)*	T													X														

[1] Twin Falls County does not occur directly under airspace.
[2] Northern Rocky Mountain gray wolf population delisted on 5 May, 2011. Pacific Northwest populations remain listed as of 3 April 2012.
[3] The northern spotted owl does not occur in the portion of the county overlain by airspace.

Key: C=candidate species for listing under the ESA; E=listed as endangered under the ESA; E/NE=experimental/nonessential (reintroduced); T=listed as threatened under the ESA; ●=USFWS-designated critical habitat occurs in the county.

Source*:* IDFG 2005; USFWS 2010a, 2010b, 2010c.

Considering the nature of the proposed uses of the project airspace, no effects are anticipated on the frogs, fish, burrowing mammals, invertebrates, or plant species listed in Table BO 3.8–1 or their associated habitats. For this reason, further discussion of these species is not included. A discussion of species that could respond to noise and overflights associated with the project follows.

Gray Wolf. The analysis of the potential effects on the experimental/nonessential gray wolf population that occurs under the airspace must address whether the F-35A aircraft scenarios could jeopardize the continued existence of the gray wolf, rather than potential impacts on individuals. With this higher threshold, the analysis results in the conclusion that this project presents no jeopardy to the species because any effect on an experimental/nonessential population, by definition, results in no jeopardy to the continued existence of the species as a whole.

Grizzly Bear. The range of the grizzly bear overlain by airspace is thought to include a relatively small area in Idaho County, Idaho. The exact range of the species in Idaho is unknown (IDFG 2005). Grizzly bears prefer remote, open, high-elevation wilderness areas where food sources such as berries, pine nuts, insects, carrion, forbs, grasses, bulbs, and corms are available, usually far from human contact. These bears will also take advantage of easy prey where fish are spawning. The only threats to this species are the loss of large habitat blocks and major food sources (such as whitebark pine nuts) and encounters with humans.

Canada Lynx. The Distinct Population Segment of Canada lynx that occurs in the contiguous United States was listed as threatened in 2000. The primary causes of Canada lynx population declines are thought to be habitat degradation, fragmentation, and loss (IDFG 2005). This species prefers high-elevation, dense, coniferous and mixed forests of northern latitudes containing adequate habitat to sustain the snowshoe hare (*Lepus americanus*), the lynx's primary prey species. Fire suppression and timber management practices have affected landscape-scale characteristics of vegetation composition and structure in areas important to lynx, which are only present in a small portion of the ROI. This species is mostly susceptible to on-the-ground disturbances that include increased competition by other carnivores and human activities, such as winter recreation, habitat fragmentation by roads and other development, illegal harvest and trapping, and other human activities.

Northern Spotted Owl. This large non-migratory owl occurs only in the cool, moist woodlands of the Pacific Northwest. Northern spotted owl habitat generally includes "old growth" forests of Douglas fir, but owls have been reported to use larger trees in almost all major types of coniferous forests that include multi-layered canopies with a moderate to high canopy closure in overstory, midstory, and understory. Spotted owls inhabit higher elevations in the southern part of their range (Oregon), which is likely related to temperature preferences. The airspace does not overlie the portion of Deschutes County that contains potential northern spotted owl habitat.

Whooping Crane. The whooping crane sightings listed for two counties in Montana that occur under the airspace were coded as being "transient," at a density of "one to two," and observed "within the last 10 to 15 years" (MFWP 2010). The whooping crane was not, however, listed for these counties on the USFWS webpage described as "where one would reasonably expect the

species to occur" (MFWP 2010). In other words, whooping crane occurrences are very rare in Montana, especially in the western portion of the state under the airspace (a portion of IR-301 that overlies extreme western Montana).

Greater Sage-Grouse. Of recent concern across the western United States, the greater sage-grouse (widely known as "sage-grouse") was added to the ESA candidate list in 2010. This large upland bird is dependent year-round on sagebrush shrublands, which have been in decline across western states. Sage-grouse population numbers have been decreasing for decades, thought to be due to the reduction in suitable habitat (Connelly et al. 2004; Rowland 2004). In 1999, growing concern for the species led to a petition to list the greater sage-grouse under the ESA. After review, USFWS ruled in 2004 that listing was not warranted (McCarthy and Kobriger 2005). Subsequent review resulted in adding the greater sage-grouse to the Federal candidate list on March 5, 2010. The species receives special management attention under the USFS, BLM, and state game and fish agencies, including those in the project area. Sage-grouse require large blocks of mature sagebrush-steppe habitat for food and cover, with flat, open grassland areas available for breeding grounds (leks). The Air Force currently conducts monitoring, surveys, and various protection measures for the sage-grouse in support of operations based at Mountain Home AFB (Mountain Home AFB 2004).

Western Population of the Yellow-Billed Cuckoo. The two subspecies of yellow-billed cuckoo (eastern and western) are considered geographically separated by the Continental Divide (BLM 2003). The western Distinct Population Segment of the yellow-billed cuckoo was accepted as a candidate species under the ESA in 2001. Western yellow-billed cuckoos are migrants that prefer open woodlands with clearings and thick, scrubby undergrowth along watercourses (BLM 2003). Nesting occurs almost exclusively close to water, and biologists hypothesize that the species may be restricted to nesting in moist river bottoms in the west because of humidity requirements for prey species (insects and occasional reptiles/amphibians) and successful rearing of the young. Canopy cover of at least 50 percent in both the understory and overstory is preferred, according to habitat models established for the western population. Based on historical accounts, this cuckoo was once considered locally common along a few river systems in New Mexico. Because of extensive riparian habitat loss, the overall range of the western yellow-billed cuckoo has decreased dramatically (BLM 2003). A 1986 study showed a 93 percent decline in population from the baseline 1975–1979 Lower Colorado Valley River population inventory, with additional documented declines in other areas (BLM 2003). It is likely that the largest contributor to the decline of cuckoo habitat in the western United States is habitat loss and the alteration attributable to management of the flow regimes of the major rivers that support riparian habitat.

Bighorn Sheep. California bighorn sheep populations have been established on lands that occur under the project airspace MOAs in southwestern Idaho, northern Nevada, and southeastern Oregon. Although not protected under the ESA and currently managed as a game species, this bighorn sheep subspecies is considered sensitive by BLM and is of interest to state resource agencies. The Air Force has developed seasonal restrictions on overflights during bighorn sheep lambing periods in specific locations throughout the training airspace, such as Areas of Critical Environmental Concern and wilderness study areas (WSAs), in addition to noise studies on wildlife (Mountain Home AFB 2004).

Auxiliary Airfield

Mountain Home AFB. In spring 1995, various biological surveys were conducted on Mountain Home AFB to support the Integrated Natural Resource Management Plan development. During vegetation surveys of Mountain Home AFB, only small, isolated stands of native habitat were located (Mountain Home AFB 2004). Surveyors determined that the majority of Mountain Home AFB and the surrounding lands was converted to nonnative vegetation by fires, agriculture, and development. Although remnant habitats were determined to be suitable for smaller common mammals, reptiles, and birds adapted to urban areas and human disturbance, no federally listed threatened or endangered species were found and limited suitable habitat was available for these species on Mountain Home AFB (Mountain Home AFB 2004).

The western burrowing owl (*Athene cunicularia hypugaea*) and long-billed curlew (*Numenius americanus*) are both considered protected non-game species in Idaho and are considered Birds of Conservation Concern by USFWS. Burrowing owls are known to occur in several areas of Mountain Home AFB. The long-billed curlew has also been observed in great numbers near the golf course, Rapid Infiltration Basin, and the annual grasslands near the north end of the flightline on Mountain Home AFB (Mountain Home AFB 2004).

BO 3.8.2.2 Airspace Environmental Consequences

The potential for adverse effects of F-35A training in the airspace and at the auxiliary airfields on endangered, threatened, or special status wildlife is minimal, as described above for vegetation and wildlife (see Section BO 3.1.2.3). Because effects on a single individual of a federally listed endangered or threatened species could be significant, however, a more-detailed consideration of impacts is required for these species. In the analysis that follows, the focus is on the activities of the aircraft in airspace overlying habitat that may be occupied by endangered or threatened species and a comparison with existing conditions, including aircraft activity in the same locations. This is followed by a species-by-species synopsis of potential effects.

All F-35A flight activities would take place in existing airspace; therefore, no airspace modifications would be required. Activities required for the F-35A on training ranges and in airspace would be similar to existing use by A-10s and F-15s, some of which would be replaced by the F-35As. Proportionately more of the F-35A sorties would occur at higher altitudes than those of the aircraft currently using the airspace, which is expected to reduce the potential to startle wildlife and domestic animals with noise and the sudden appearance of overflying aircraft in low-level flight (i.e., below 1,000 feet AGL). Table BO 2.2–3 provides a comparison of altitude use between A-10 and F-15 aircraft, which currently use the airspace, and F-35A aircraft. Only 15 percent of F-35A flight hours would be below 10,000 feet AGL, whereas 96 percent and 42 percent of the flight hours of A-10s and F-15s, respectively, would be spent below 10,000 feet AGL. At the altitudes where the F-35A would spend most of its time, overflight noise (as perceived from the ground) would increase relatively gradually from ambient to the peak noise level. Overflight events at these altitudes would not be expected to be startling to animals or to have other adverse impacts. Guided munitions used for F-35A training would be expected to be released from higher altitudes than conventional munitions employed by existing aircraft using the training ranges. Their use would be confined to existing target areas within existing restricted airspace except on no drop sites.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training. Supersonic flight is authorized at or above 10,000 feet AGL in portions of the Owyhee and Jarbidge MOAs not overlying the Duck Valley Reservation and in restricted areas associated with Saylor Creek and Juniper Butte Ranges. Supersonic flight is also authorized above 30,000 feet MSL in the Jarbidge South, Owyhee South, and Paradise North/South ATCAAs (see Table BO 2.2–1). Supersonic flight is not authorized on MTRs or in the Saddle MOA. Sonic booms generated by F-35A aircraft would be slightly less intense in terms of overpressure than sonic booms generated by F-15 aircraft during equivalent flight profiles. The projected average number of sonic booms per day would increase slightly or stay the same under all scenarios beneath the airspace units where supersonic flight is authorized. Proposed F-35A training in the Jarbidge North MOA, R-3202, and R-3204 would slightly increase the average number of booms per day at any given location near the center of the airspace from 2.0 under baseline conditions to 2.1 under Scenario B1, 2.2 under Scenario B2, and 2.4 under Scenario B3. A similar trend is observed beneath the Owyhee North MOA, with the average number of sonic booms per day increasing from 1.9 under baseline conditions to 2.0 under Scenario B1, 2.1 under Scenario B2, and 2.2 under Scenario B3. Projected sonic booms would remain the same, at 0.6 booms per day, in the Jarbidge South, Owyhee South, and Paradise North and South ATCAAs (see Table BO 3.2–5).

Table BO 3.8–2 provides a species-specific assessment of potential effects on listed and candidate species in the ROI.

Table BO 3.8–2. Potential Effects on Federally Listed and Candidate Species Known or Likely to Occur Under Primary Use Airspace and on Ranges

Species[1]	***Potential Presence in Project ROI***	***Potential Adverse Effects***
Gray wolf (Population west of Oregon Highways 395/78/95)	Widely dispersed in remote areas under Idaho and Montana MTRs.	The gray wolf was reintroduced to remote, forested areas and is considered by USFWS to have experimental/nonessential (E/NE) status. Under E/NE status, no formal ESA Section 7 consultation is required regarding potential impacts of land uses on these populations. Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions. The proposed scenarios, which would replace similar activities, would reduce the number of sorties flown in both Instrument Routes that overlap with wolf habitat. This is expected to reduce potential disturbance of resident gray wolves compared with baseline conditions, if there is any change at all; therefore, no adverse effects on the gray wolf or its habitat under the airspace are expected. Based on (1) the very low percentage of time spent in low-level flight by F-35As training within the airspace and (2) the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, there are no anticipated adverse effects on the gray wolf from overflights or noise associated with the addition of F-35A training.
Grizzly bear	Unknown, potentially present in northern Idaho under IR-301/307.	Little is known about where grizzly bears reside, but remote habitat under IR-301/307 was indicated as potential. IR-301/307 is expected to be used for fewer sorties under all scenarios compared with baseline conditions. Based on this and the reasons listed for the gray wolf above, there are no expected adverse effects on the grizzly bear or its habitat under the airspace from overflights or noise associated with the addition of F-35A training.

Species[1]	*Potential Presence in Project ROI*	*Potential Adverse Effects*
Canada lynx	Widely dispersed in remote areas under Idaho and Montana MTRs.	Similar to the gray wolf, this species resides in low numbers widely scattered in remote areas and is expected to be exposed to fewer sorties under both Instrument Routes compared with baseline conditions. Based on this and the reasons listed for the gray wolf above, there are no expected adverse effects on the Canada lynx or its habitat under the airspace from overflights or noise associated with addition of F-35A training.
Northern spotted owl	No MOAs or MTRs occur over current or proposed critical habitat.	The potential for overflight impacts on the closely related Mexican spotted owl (MSO) has been studied in some detail, and the findings are expected to be applicable to the northern spotted owl. MSOs did not flush from a nest or perch unless a helicopter was as close as 330 feet (Delaney et al. 1997). F-16 overflights produced minimal responses at elevations of about 2,000 feet above MSOs (Johnson and Reynolds 2002). It was also noted that MSO responses to the F-16 overflights were often less dramatic than responses to naturally occurring events, such as thunderstorms. Studies conducted by Air Combat Command (ACC) found that aircraft overflights had no effect on occupancy of MSO activity centers and found no correlation between measures of aircraft exposure and nesting success (ACC 2008). In addition, the chance of accidental bird–aircraft strike is unlikely, not predictable, and not measurable, and is, therefore, insignificant and discountable. No adverse effects from the F-35A beddown are expected.
Greater sage-grouse	Under Idaho, Oregon, and Nevada airspace.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions, and changes in the noise environment are not expected to adversely affect the greater sage-grouse or its habitat under the airspace. Current literature has not shown adverse effects from routine training overflights on this species (see Appendix B). Any impacts of overflight would be insignificant and would not reach the scale at which take would occur. This bird is a low-flying species, and the potential for a bird–aircraft strike is so low as to be discountable. No adverse effects from the F-35A beddown are expected.
Yellow-billed cuckoo (Western U.S. Distinct Population Segment)	Limited range along riparian habitats of counties in Idaho, Oregon, and Nevada.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions, and slight changes in the noise environment would not reach the scale at which take would occur. The yellow-billed cuckoo's preferred habitat of thick, riparian canopy cover is expected to minimize or eliminate any visual appearance of an overflying aircraft. The potential for a bird–aircraft strike is so low as to be discountable.
Whooping crane (transient)	Rarely recorded migrating over two counties in Montana.	Even though flight altitudes of whooping cranes in migration may overlap with aircraft flight levels, because of the species' very small population and aircraft route avoidances of waterways, the potential for a bird–aircraft strike is so low as to be discountable. No adverse effects from the F-35A beddown are expected.

[1] See Table BO 3.8–1 for species status and additional information on species distribution with respect to areas proposed for use for F-35A training.

In conclusion, although it is possible for a federally-listed, proposed, or candidate wildlife species to exhibit a temporary response to a low-level overflight or sonic boom, such as assuming an alert posture, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which "take" occurs (as defined in the ESA). The probability of a bird–aircraft strike involving injury to a listed, proposed, or candidate species is so low as to be discountable. Therefore, impacts of the project on listed, proposed, or candidate species and their habitat would be less than significant. These circumstances are consistent with "may affect, not likely to adversely affect" listed or proposed species and "would not adversely modify critical habitat" determinations under the ESA. In the event that Boise AGS becomes the Preferred Alternative, the Air Force will submit these findings to USFWS and seek its concurrence with this determination in compliance with the ESA.

BO 3.9 Cultural Resources (Archaeological, Architectural, Traditional, Native American Consultation)

For purposes of compliance with Section 106 of the National Historic Preservation Act (NHPA) and in accordance with 36 CFR Section 800.4 (a)(1), the area of potential effect (APE) under the Boise AGS alternative has been defined. The APE for direct and indirect impacts is considered to be Boise AGS, which comprises 576 acres, although actual potential construction impacts would involve a much smaller area (see Figure BO 2.1–1); Mountain Home AFB, as shown in Figures BO 3.2–5 through BO 3.2–7; and the MOAs/ATCAAs, MTRs, and Restricted Areas shown as primary use airspace in Figure BO 2.2–1. The definition of cultural resources and methodology for analysis are described in Chapter 3, Section 3.7.

BO 3.9.1 Base

BO 3.9.1.1 Base Affected Environment

Archaeological Resources. All installation areas with a high sensitivity for archaeological resources have been surveyed, including 49 acres of non-installation land proposed as the location of the new munitions storage area (Boise 2001; NGB 2000; Idaho ANG 2006). Recorded resources consist of one isolated projectile point, two sites associated with homesteading or agricultural use of the area, and one site associated with post-World War II military use. All four sites have been determined ineligible for listing in the National Register of Historic Places (NRHP). Little potential exists for intact significant archaeological deposits in the developed areas of the installation due to the ground disturbance caused by previous construction.

Historic Architectural Resources. A comprehensive inventory of buildings constructed before 1958 was conducted at Boise AGS in 1995 (NGB 2000). During this inventory, 104 buildings, 94 of which date from the World War II era, were recorded and evaluated for NRHP eligibility. Ten buildings or structures built in the 1950s were evaluated for Cold War significance. It had been recommended previously (Idaho ANG 2003) that Cold War era buildings dating from the 1960s through 1989 require inventory and evaluation against NRHP criteria within the Cold War context, as these were not previously inventoried. The 1995 architectural inventory of the installation (NGB 2000) identified three potential historic districts (a World War II Officers' Quarters Historic District, a World War II Enlisted Men's Barracks Historic District, and a World War II Ordnance Area Historic District) and several individually eligible buildings

(see Figure BO 3.9–1 and Appendix C, Tables C–1, C–2 and C–3). The Idaho State Historic Preservation Office (SHPO) concurred with the NRHP determinations of the World War II Officers' Quarters and World War II Enlisted Men's Barracks Historic Districts. The SHPO further determined that the World War II Ordnance Area did not meet NRHP significance criteria for a historic district. However, through consultation, the 124 FW and the SHPO determined that 4 buildings are individually eligible for the NRHP (Idaho ANG 2003; see Appendix C, Table C–1).

Three of the buildings determined to be individually eligible for the NRHP (Idaho ANG 2003) are located at the east end of the installation in and near what was designated the World War II Ordnance Area (Idaho ANG 2003). The World War II headquarters building (Facility 307) was also determined to be individually eligible for listing in the NRHP.

Historic Districts. The World War II Officers' Quarters Historic District consists of 10 officers' quarters, an officers' mess hall, and an officers' club clustered in the southwestern part of the original base cantonment (see Appendix C, Table C–2). No buildings have been removed or added to the group since it was built in 1941 (NGB 2000). At the time they were recorded in 1995, the buildings had been re-sided, but retained their historic form, scale, and massing and most period doors and windows. Field reconnaissance in 2002 indicated that most of the windows had been replaced with sliders or vinyl-clad, press-on muntin types (Idaho ANG 2003). One of the quarters (Facility 707) was described as the only remaining World War II housing unit on base that still displayed the original wood siding and wooden, ladder-type fire escape (NGB 2000). Building 707 has been remodeled to a 700-series appearance but with nonhistoric materials, including a new pent roof, exterior staircase, and manufactured siding in place of the original wood (Idaho ANG 2003).

When it was inventoried in 1995, the World War II Enlisted Men's Barracks Historic District represented a "near-complete collection" of 12 barracks and three mess halls (NGB 2000; see Appendix C, Table C–3). The buildings had all been re-sided and the pent roofs removed, but they retained their original form, scale, and massing and most period doors and windows. Field reconnaissance in 2002 indicated that most of the buildings in this district retained original-style windows and exterior chimneys. In some cases, the original horizontal siding was still visible between the newer siding and the doorjambs (Idaho ANG 2003).

Traditional Cultural Resources and Native American Concerns. The 124 FW has conducted regular coordination with the area tribes and, to date, no Native American traditional cultural properties (TCPs) or traditional cultural resources at the installation have been identified (Idaho ANG 2003).

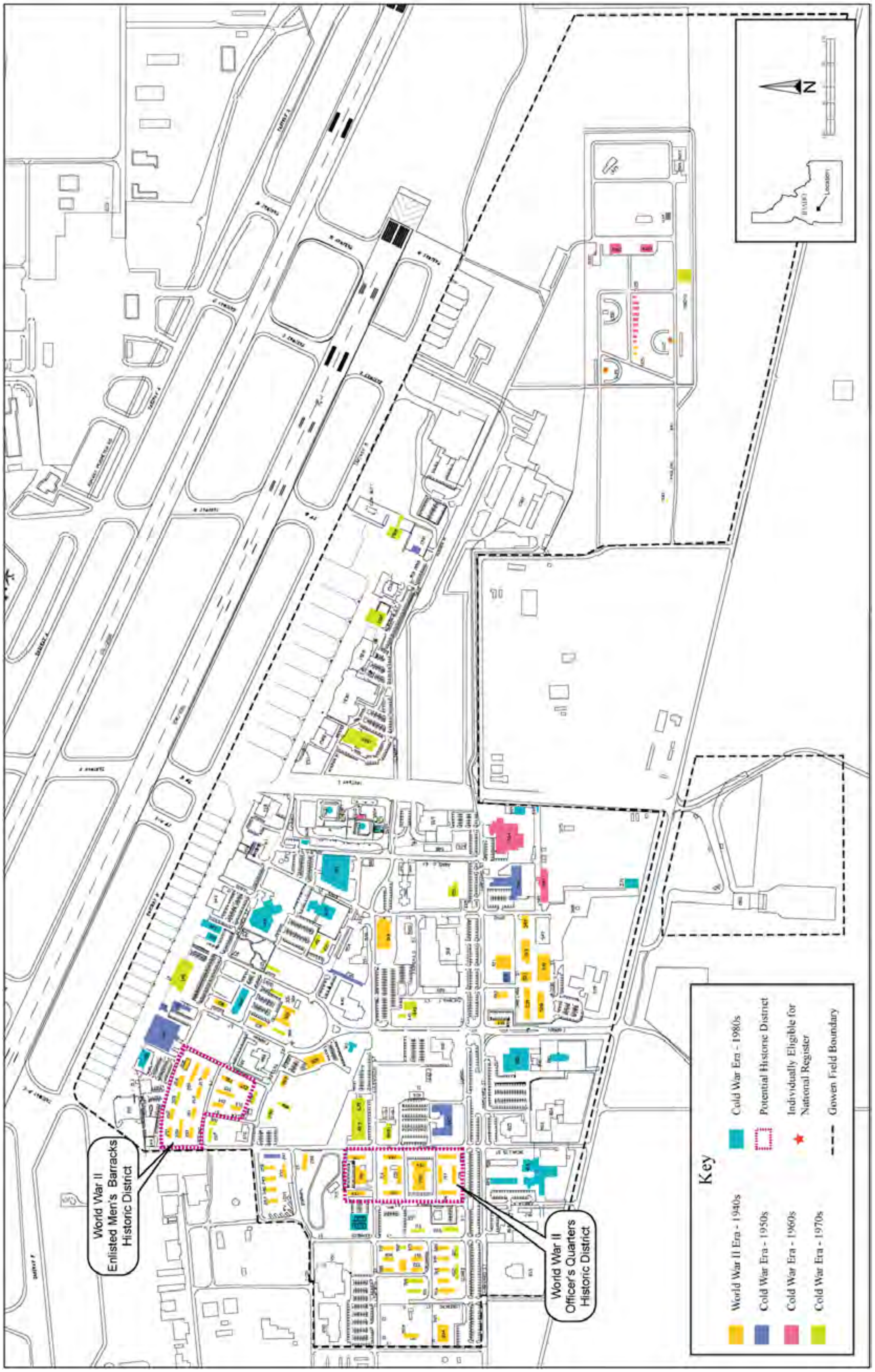


Figure BO 3.9–1. Boise AGS Historic Districts and NRHP-Eligible Buildings

BO 3.9.1.2 Base Environmental Consequences

Scenario B1. Under this scenario, 24 F-35A aircraft would be bedded down at Boise AGS and the existing 18 A-10 aircraft would remain.

Impacts on archaeological resources are not expected under this scenario, as all four known sites have been determined to be ineligible for listing in the NRHP. Unsurveyed portions of the project area would be addressed in compliance with NHPA Section 106 prior to construction.

There is always the possibility that previously unknown or unrecorded archaeological resources could be present beneath the ground surface, sometimes underneath existing development. In the unlikely event that previously unrecorded or unevaluated cultural resources are encountered during construction, Boise AGS would manage these resources in accordance with the Boise AGS Integrated Cultural Resources Management Plan (Idaho ANG 2003), adhering to Federal and state laws, as well as Air Force regulations.

Indirect impacts on archaeological resources at Boise AGS due to personnel changes are not expected. Although the number of skilled personnel needed to operate and maintain the wing and provide necessary support services will increase, the on-base population will not increase.

Although no building demolitions are planned as a result of the F-35A beddown, impacts on architectural resources could occur under this scenario. New construction would take place at least 2,000 feet away from the World War II Officers' Quarters and World War II Enlisted Men's Barracks Historic Districts. The Maintenance Hangar (Building 148) and Squadron Operations Building (Building 400) have been evaluated and determined to be ineligible for listing in the NRHP (Idaho ANG 2003). Exterior renovation designs within the viewshed of the historic district would conform to the base architectural, landscape, interior design, and engineering standards and to the Secretary of the Interior's *Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings* (Weeks and Grimmer 2005). Exterior renovation designs also would be submitted to the Idaho SHPO for review. In compliance with NHPA Section 106, the Air Force has completed consultation with the Idaho SHPO regarding potential impacts on historic properties and received concurrence that basing the F-35A training mission at Boise AGS will have no effect on historic properties (see Appendix C).

Impacts on traditional cultural resources are unlikely under this scenario, as no Native American TCPs or traditional cultural resources at the installation have yet been identified. In the event that previously unrecorded or unevaluated traditional cultural resources are encountered during construction, procedures for the Inadvertent Discovery of Archaeological Resources are in place at Boise AGS, as contained in the Cultural Resources Management Plan (Idaho ANG 2012).

Projected construction and renovation projects required under this scenario include construction of 15 new buildings or facilities and associated infrastructure, a 1,000-foot-long overrun, and additions or alterations to 3 buildings (the Squadron Operations Building [400], Maintenance Hangar [148], and Support AGE Maintenance Facility [600]) and 6 other structures (see Table BO 2.1–2).

Scenario B2. Under this scenario, 48 F-35A aircraft would be bedded down at Boise AGS. Projected construction and renovation projects required under this scenario would be similar to those described for Scenario B1 (see Table BO 2.1–2), with the addition of a new squadron operations building. Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario B1, but with slightly more ground disturbance.

Scenario B3. Under this scenario, 72 F-35A aircraft would be bedded down at Boise AGS. Projected construction and renovation projects required under this scenario would be the same as those described for Scenario B1, with the addition of a new squadron operations/aircraft maintenance unit. Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario B1.

BO 3.9.2 Airspace

BO 3.9.2.1 Airspace Affected Environment

Table BO 3.9–1 presents the NRHP-listed sites and Indian Reservation lands under the various blocks of training airspace associated with Boise AGS. The Boise AGS training airspace overlies at least part of 12 Idaho counties (Adams, Blaine, Butte, Camas, Cassia, Custer, Elmore, Lemhi, Minidoka, Owyhee, Valley, and Washington), 2 Montana counties (Beaverhead and Ravalli), 5 Oregon counties (Crook, Deschutes, Harney, Lake, and Malheur), 2 Nevada counties (Elko and Humboldt), and 1 Utah county (Box Elder). Forty-three NRHP-listed properties have been identified under Boise AGS airspace (see Appendix C, Table C–4). In addition, many more eligible or potentially eligible cultural resources associated with the history of the region are likely to underlie airspace.

Five traditional cultural resources in southwestern Idaho have been recommended as eligible for listing in the NRHP as TCPs (Air Force 1998). In addition, it is likely that other resources in the area could qualify as TCPs, and there are many archaeological sites and natural features that may be considered traditional cultural resources (Air Force 1998). The exact location of all traditional cultural resources is confidential.

Table BO 3.9–1. NRHP-Listed Sites and Indian Reservation Lands Under Boise AGS Training Airspace

Airspace Designation	*Number of NRHP Properties Under Airspace*[1]	*Indian Reservation Lands Under Airspace*
Saddle MOA	2	None
Jarbidge North and South MOAs	2	None
Owyhee North and South MOAs	0	Duck Valley Reservation
Paradise North and South MOAs	2	Fort McDermitt Reservation
IR-301/307	32	None
IR-302/305	3	None
VR-316/319	3	None
VR-1302	0	None
MHRC (Saylor and Juniper Butte)	0	None

[1] More-complete information concerning NRHP-listed properties is found in Appendix C, Table C–4.

Auxiliary Airfield

Mountain Home AFB. Mountain Home AFB is identified as the auxiliary airfield for Boise AGS F-35A aircraft. Mountain Home AFB is an active airfield with frequent noise, and there are no NRHP-listed properties within the boundaries of Mountain Home AFB (NRIS 2011).

BO 3.9.2.2 Airspace Environmental Consequences

Scenario B1. Under this scenario, 24 F-35A aircraft would be bedded down at Boise AGS and would train in the primary use airspace units listed in Table BO 2.2–1.

Under Scenario B1, total sortie-operations conducted annually in the various primary use training airspace units (MOAs and MTRs) would increase over baseline conditions by between 7 and approximately 22 percent (see Table BO 2.2–1). Subsonic noise would increase slightly under some of the MOAs and low-level MTRs. Noise levels would increase to 65 dB DNL_{mr} beneath Owyhee North and Jarbidge North MOA/ATCAAs, R-3202, and R-3204A/B. Beneath the centerlines of IR-301/307 and IR 302/305, noise levels would increase to 66 dB DNL_{mr}. Supersonic events (sonic booms) would be expected to increase by approximately 5 percent beneath Jarbidge North and Owyhee North MOA/ATCAAs, as well as beneath R-3202 and R-3204A/B. The number of sonic booms would remain approximately the same beneath other airspace units. No supersonic events would be conducted in the Saddle A or B MOAs/ATCAAs because supersonic events are not authorized in these airspace units.

No impacts on historic properties under airspace associated with Boise AGS are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operations would be even less likely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-15, A-10, and transient aircraft has not impacted historic properties. Although there would be an increase in subsonic noise under the MOAs and MTRs, it would not be of sufficient magnitude to impact historic properties under airspace. F-35As will typically operate at higher altitudes than F-15s, and impacts on historic properties from noise are not expected. Flare and inert munitions use is not expected to impact significant historic properties under airspace. Existing use of flares by F-15 aircraft is not known to have impacted these resources; therefore, their use by F-35A aircraft is not expected to result in impacts. In compliance with NHPA Section 106, the Air Force has completed consultation with the Idaho, Nevada, Utah, Montana, and Oregon SHPOs regarding potential impacts on cultural resources and received concurrence that basing the F-35A training mission at Boise AGS will have no effect on historic properties beneath training airspace (see Appendix C).

<u>Native American Concerns.</u> During the EIS public scoping process, the Air Force contacted the Burn Paiute Tribe, Northwestern Band of Shoshone, Paiute and Shoshone Tribe of Fort McDermitt, Shoshone-Bannock Tribes, and Shoshone-Paiute Tribes of Duck Valley to invite them to attend the public meetings and express their concerns about the potential F-35A beddown at Boise AGS. During the scoping process, including the public meetings, no comments regarding potential impacts on traditional cultural resources or TCPs were received.

In accordance with Section 106 of the NHPA and Executive Order 13175, the Air Force also has contacted the Native American tribes listed in Appendix C to consult on a government-to-government basis regarding their concerns about potential impacts on traditional cultural resources and TCPs under airspace associated with Boise AGS. After sending letters and contacting the tribes by telephone, the Air Force has received two responses as of April 2012. The Klamath General Council and the Northwestern Band of the Shoshone Nation, Brigham City Office, expressed interest in the Air Force's action. The Klamath Tribes expressed concerns over the timing and elevation of training flights and do not want the training flights to affect migration of game animals or disturb ceremonial gatherings.

Two Indian Reservations underlie Boise AGS primary use airspace (see Figure BO 2.2–1). TCPs and other traditional cultural resources are known to underlie this airspace. However, during Air Force consultation with interested Native American groups regarding airspace actions, the Shoshone-Paiute Tribes and the Fort McDermitt Paiute and Shoshone Tribe did not express concerns regarding the proposed Air Force use of airspace.

Scenario B2. Under this scenario, 48 F-35A aircraft would be bedded down at Boise AGS and would train in the primary use airspace units listed in Table BO 2.2–1.

Under Scenario B2, total sortie-operations conducted annually in the various primary use training airspace units would increase over baseline conditions by between approximately 12 and 94 percent (see Table BO 2.2–1). Subsonic noise would increase under all the MOAs and low-level MTRs. Noise levels would increase to 66 dB DNL_{mr} beneath Jarbidge North MOA/ATCAA, R-3202, and R-3204A/B and the centerline of IR-301/307. Beneath Owyhee North MOA/ATCAA, noise levels would increase to 65 dB DNL_{mr}, and beneath the centerline of IR-302/305, noise levels would increase to 67 dB DNL_{mr}. Supersonic events (sonic booms) would be expected to increase by approximately 10 percent beneath Jarbidge North and Owyhee North MOA/ATCAAs, as well as beneath R-3202 and R-3204A/B. The number of sonic booms would remain approximately the same beneath other airspace units. Noise levels would remain below 65 dB DNL_{mr} beneath all airspace units except IR-301/307 and VR-1302, beneath the centerlines of which noise levels are approximately 64 and 45 dB DNL_{mr}, respectively, under baseline conditions. Beneath the centerlines of IR-301/307 and VR-1302, noise levels would be 66 dB DNL_{mr}. Supersonic events (sonic booms) are expected to increase slightly, but will remain within the parameter of 1–2 per day as under the baseline conditions.

As under Scenario B1, no impacts on historic properties under airspace associated with Boise AGS are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-15, A-10, and transient aircraft has not impacted historic properties, and the incremental increase in noise, as well as continued flare and inert munitions use, is not expected to affect historic properties under airspace.

<u>Native American Concerns.</u> Native American concerns about potential impacts on traditional cultural resources under the airspace are as described for Scenario B1 above. Two Indian Reservations underlie airspace associated with Boise AGS (see Figure BO 2.2–1). TCPs and other traditional cultural resources are known to underlie this airspace. However, during Air Force consultation with interested Native American groups regarding airspace actions, the

Shoshone-Paiute Tribes and the Fort McDermitt Paiute and Shoshone Tribe did not express concerns regarding the proposed Air Force use of airspace.

Scenario B3. Under this scenario, 72 F-35A aircraft would be bedded down at Boise AGS and would train in the primary use airspace units listed in Table BO 2.2–1.

Under Scenario B3, total sortie-operations conducted annually in the various primary use training airspace units would increase over baseline conditions by between approximately 19 and 152 percent over baseline conditions (see Table BO 2.2–1). Noise levels would increase to 67 dB DNL_{mr} beneath Jarbidge North MOA/ATCAA, R-3202, and R-3204A/B and the centerline of IR-301/307. Beneath Owyhee North MOA/ATCAA, noise levels would increase to 66 dB DNL_{mr}, and beneath the centerline of IR-302/305, noise levels would increase to 68 dB DNL_{mr}. Supersonic events (sonic booms) would be expected to increase by approximately 20 percent beneath Jarbidge North and Owyhee North MOA/ATCAAs, as well as beneath R-3202 and R-3204A/B. The number of sonic booms would remain approximately the same beneath other airspace units. No supersonic events would be conducted in the Saddle A or B MOAs/ATCAAs because supersonic events are not authorized in these airspace units.

Like Scenario B1, no impacts on historic properties under airspace associated with Boise AGS Boise AGS are expected under this scenario. Scientific studies regarding the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-15, A-10, and transient aircraft has not impacted historic properties, and the incremental increase in noise as well as continued flare and inert munitions use is not expected to impact historic properties under airspace.

<u>Native American Concerns.</u> Native American concerns about potential impacts on traditional cultural resources under the airspace are as described for Scenario B1 above. Two Indian Reservations underlie airspace associated with Boise AGS (see Figure BO 2.2–1). TCPs and other traditional cultural resources are known to underlie this air space. However, during Air Force consultation with interested Native American groups regarding airspace actions, the Shoshone-Paiute Tribes and the Fort McDermitt Paiute and Shoshone Tribe did not express concerns regarding the proposed Air Force use of airspace.

BO 3.10 Land Use and Recreation

BO 3.10.1 Base

BO 3.10.1.1 Base Affected Environment

Land Use

Regulatory Setting. The following information addresses Federal, state, and local statutes, regulations, programs, and plans that are relevant to the analysis of land use for Boise AGS. Because potential land use impacts are largely noise-related, the discussion of regulatory setting focuses on noise-related land use regulations and compatibility constraints.

Gowen Field Master Plan (1997). A master plan was prepared and adopted for Boise AGS in 1997 (Idaho ANG 1997). The plan identifies existing conditions, assesses future development scenarios, and seeks to ensure the orderly future development of the installation. The Master Plan includes selected future development plans, a circulation plan, a land use plan, a buildings and facilities site plan, and an exterior architecture and landscaping plan.

Boise Airport Part 150 Study Update (2006). The Part 150 Study Update (Boise 2006) presents current and future land uses in communities around the Boise Air Terminal Airport and assesses the compatibility of that land use with the current and probable future noise levels. The study uses this assessment to formulate a plan of land use and noise abatement measures, as outlined in the Noise Compatibility Program, to reduce noise and its impact on people.

The study calculated aircraft noise levels, identified land uses near the airport, and forecast the changes that are expected in the future. The FAA accepted the Noise Exposure Maps in August 2005. In February 2006, the FAA approved many elements of the Noise Compatibility Program, which consists of measures to limit aircraft noise, encourage zoning that is more appropriate for land use in noisy areas, and provide better community coordination and responses to complaints.

Boise Airport Master Plan (Boise 2008a). The Boise Airport Master Plan addresses potential activity and related improvements through 2027. It projects future demand at the airport, identifies requirements, defines development concepts, provides a strategy for implementing the recommended improvements, analyzes funding for the development program, and identifies environmental issues associated with the recommended development. The Master Plan indicates that the City of Boise leases Boise AGS to the Idaho National Guard and identifies the installation and associated runways and assault strips.

Local Regulations and Ordinances. The Ada County and City of Boise Comprehensive Plans take into consideration anticipated growth at the Boise Air Terminal Airport as identified in the Airport Master Plan. Both comprehensive plans have established designations around the airport to protect the existing environment from excessive noise and to protect existing noise-generating activities from encroachment of noise-sensitive uses.

The City of Boise Comprehensive Plan identifies Airport Influence Areas (AIAs) based on noise levels within the respective areas and establishes policies to protect the Boise Air Terminal

Airport from encroachment of incompatible uses (Boise 2008a). Generally, land within and immediately surrounding the airport is designated as AIA B/C (average sound levels of 65–70 dB DNL and greater than 70 dB DNL, respectively), while land to the northeast, east, south, and west of the airport is designated as AIA A (average sound levels of 60–65 dB DNL). An area to the north and northwest of the airport is designated as AIA B-1 (average sound levels of 65–70 dB DNL). The Ada County Comprehensive Plan also designates AIAs. These areas are similar to those in the City of Boise's Comprehensive Plan and have similar restrictions on development within the area near the airport.

On-Base Land Use. Boise AGS is located within the boundaries of the Boise Air Terminal Airport in the city of Boise. Boise Air Terminal Airport is classified as a primary commercial service airport. The city of Boise extends to the north and west of the airport, while unincorporated Ada County surrounds the remaining area.

Boise Air Terminal Airport is designated by the City of Boise as service commercial land use and zoned for commercial, industrial, and open space (Boise 2008a). Boise AGS is designated by the City of Boise as airport land use and zoned as a limited industrial development area (Boise 1997; NGB 2009). Boise AGS occupies approximately 576 acres, with an additional 1,425 acres in joint use. The land on which Boise AGS is located is secured for military use through a lease agreement with the city. The city maintains and operates the Boise Air Terminal Airport and Boise AGS facilities as a joint civil–military airport. However, within the 576-acre lease, Boise AGS has exclusive use authority for construction and other activities.

Boise AGS has historically used facilities in the northern and southeastern areas of the installation. The 124 FW retains overall responsibility for management of the installation. The remaining facilities are subleased by the Air Force to other DoD tenants (NGB 2009).

Land uses at Boise AGS include restricted safety/environmental zones, airfield pavement, aircraft maintenance, aircraft operations, industrial, command and support, special categories, open space, army barracks/dining halls, recreation, and commercial and service (Idaho ANG 1997).

The Boise AGS Master Plan identifies office (command and support activities), commercial and service, and residential (barracks) land uses. Open space areas associated with landscaping, recreation, and undeveloped areas constitute approximately 30 percent of the land area.

A discussion of baseline noise conditions on Boise AGS is presented in Section BO 3.2.

Surrounding Land Use. Areas north of the airport are fully developed and contain residential, commercial, industrial, and recreational land uses. Zoning is commercial, limited office, light industrial, and residential.

An industrial area east of the airport is partially developed, beyond which are commercial, residential, and recreational uses. Zoning in this area includes industrial and open lands.

The area to the south of the airport is sparsely developed open/agricultural land with some industrial development. This area is primarily designated as airport conservation, which is reserved for future airport expansion but allows limited land use, such as livestock grazing,

mining, farming, and non-intensive recreation (e.g., golf courses) (Boise 2008a). These areas are zoned primarily for industrial, rural preservation, and open lands.

The area to the west of the airport is partially developed and includes industrial development and open space, beyond which are residential and some recreational land uses. The zoning designation for these areas includes airport industrial use and open lands, with small residential districts interspersed (Boise 2008a).

Land uses most sensitive to noise typically include residential, institutional (e.g., school, place of worship, or hospital), and areas associated with cultural and recreational uses. The predominant off-base land use within the 65 dB DNL and above noise contours is industrial, with some residential and public/quasi-public areas (see Table BO 3.10–1).

Table BO 3.10–1. Off-Base Land Uses within the Boise AGS 65 dB DNL and Greater Noise Contours, Baseline Conditions

Contour Interval (dB DNL)	*Land Use (acres)*						*Total Area Affected*
	Commercial	**Industrial**	**Open**	**Public/ Quasi-Public**	**Recreational**	**Residential**	
65–69	0	44	0	16	1	21	82
70–74	0	0	0	5	0	2	7
75–79	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0
≥ 85	0	0	0	0	0	0	0
Total	**0**	**44**	**0**	**21**	**1**	**23**	**89**

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acres are displayed as whole numbers in the text and tables, whereas calculations are based on raw [GIS] acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.
Source: Boise 2006; Boise 2010d.

Recreation

Boise AGS provides no public recreation amenities. Recreational sites in the area surrounding the airport are primarily within the jurisdiction of the City of Boise. The city's Parks and Recreation Department maintains over 90 parks, 23 miles of greenbelt open space, and 1,200 acres of open space in the foothills (Boise 2004). The 2004 Comprehensive Parks and Recreation System Plan Update addresses the needs of both residents and non-residents, recognizing the importance of recreation for public health, quality of life, and the economy. The city supports public golf courses, regional and neighborhood parks, outdoor sports complexes, swimming pools, bike and hiking trails, and other open space areas. Land to the south of the airport is primarily privately owned, agricultural, and undeveloped, with no recreational facilities. Table BO 3.10–2 lists amenities around the airfield with the current noise level and compatibility rating. In addition to public recreation facilities, several schools in the vicinity of the airport have outdoor recreational facilities. The City of Boise and various organizations also provide seasonal outdoor performances and events during the summer.

Table BO 3.10–2. Recreational Amenities Around Boise AGS

Recreational Amenity	*Type/Activities*	*Current Noise Level (dB)*	*Compatibility (Y/N)*
Canal path/Holcomb trail	Walking, jogging, biking	< 65	Y
Cypress Park	Neighborhood park	< 65	Y
Grace Johnson Community Center	Indoor community facilities	< 65	Y
Hillcrest Country Club	Golf, tennis, swimming	< 65	Y
Greenbelt Pathway	Walking, biking along the river	< 65	Y
Idaho Ice World	Indoor skating/ice sports	< 65	Y
Indian Lakes Public Golf Course	Golf	< 65	Y
Kroeger Park	Playground	< 65	Y
Molenaar Community Park (planned)	Playground, play fields	< 65	Y
Murgoitio Regional Park	Swimming, ball fields, courts, playground, picnicking	< 65	Y
Owyhee Neighborhood Park	Basketball, playground, tennis, practice fields	< 65	Y
Philippi Neighborhood Park	Ball court games, playground	< 65	Y
Proposed rail path	Biking, walking/jogging	< 65	Y
Shoshone Park	Playground, tennis, practice fields	< 65	Y
Simplot Sports Complex	Baseball, soccer, playground	< 65	Y

Ada County uses the Boise Airport Master Plan to guide land use decisions on parts of the county within the AIA. The 2007 Ada County Comprehensive Plan describes open space uses such as greenways, parks, agriculture, and recreation as compatible within the AIA (Ada County 2007). Although over half the land in Ada County is federally or state-owned, most of the land around the airport is privately owned and is not used for public recreation.

BO 3.10.1.2 Base Environmental Consequences

Land Use

The land use resource area definition and methodology for analysis are discussed in Chapter 3, Section 3.8.

Scenario B1. The F-35A training beddown would require construction and modification of facilities within Boise AGS (see Table BO 2.1–2). No additional construction is projected for any locations outside of the installation. The land uses on the installation are characteristic of a military airfield. New or modified facilities would be designed and sited to be consistent with the base master plan, airfield safety guidelines, and related planning programs to ensure that projected development would be compatible with surrounding land uses. Land use impacts on surrounding communities during construction are expected to be minimal because projected development would be contained within existing military designations at Boise AGS. In addition, traffic, noise, dust, and similar effects from construction equipment and vehicles would be reduced through construction plans and management practices agreed to by contractors.

A discussion of projected on-base noise levels under Scenario B1 is presented in Section BO 3.2. Activities under Scenario B1 would increase the area surrounding Boise AGS within the 65 dB DNL or greater noise contour by 2,944 acres compared with baseline conditions (see Table BO 3.10–3 and Figure BO 3.10–1). The estimated number of persons affected by the projected increase would be 2,962. The largest increase in acreage would be industrial, followed by residential, then other uses. The residential area is predominantly low-density (two to six dwelling units per acre), single-family developments with some medium- to high-density (15 to 43 dwelling units per acre) developments (Boise 1997).

Table BO 3.10–3. Off-Base Land Uses within the Boise AGS 65 dB DNL and Greater Noise Contours, F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Generalized Land Use (Off-Installation/Airport)*													
	Commercial		Industrial		Open		Public/ Quasi-Public		Recreational		Residential		Total Area Affected	
	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change
Scenario B1 (24 Aircraft)														
65–69	378	378	1,599	1,555	38	38	38	22	50	49	254	233	2,356	2,274
70–74	32	32	383	383	0	0	15	10	11	11	79	77	520	513
75–79	2	2	72	72	0	0	14	14	1	1	40	40	129	129
80–84	0	0	1	1	0	0	11	11	0	0	12	12	24	24
≥ 85	0	0	0	0	0	0	2	2	0	0	0	0	2	2
Total	**412**	**412**	**2,055**	**2,011**	**38**	**38**	**80**	**59**	**62**	**61**	**385**	**362**	**3,031**	**2,944**
Scenario B2 (48 Aircraft)														
65–69	408	408	1,798	1,754	416	416	32	16	166	165	575	554	3,395	3,313
70–74	184	184	962	962	0	0	28	24	29	29	117	115	1,320	1,314
75–79	8	8	177	177	0	0	7	7	5	5	56	56	253	252
80–84	0	0	17	17	0	0	18	17	1	1	25	25	60	60
≥ 85	0	0	0	0	0	0	6	6	0	0	4	4	10	10
Total	**600**	**600**	**2,954**	**2,910**	**416**	**416**	**91**	**70**	**201**	**200**	**777**	**754**	**5,038**	**4,949**
Scenario B3 (72 Aircraft)														
65–69	471	471	1,708	1,663	867	867	24	9	209	208	1,132	1,111	4,411	4,330
70–74	355	355	1,376	1,376	9	9	37	32	39	39	197	195	2,012	2,006
75–79	21	21	296	296	0	0	10	10	9	9	69	69	406	406
80–84	1	1	53	53	0	0	16	16	1	1	37	37	108	108
≥ 85	0	0	0	0	0	0	12	12	0	0	10	10	22	22
Total	**848**	**848**	**3,433**	**3,388**	**876**	**876**	**99**	**79**	**258**	**257**	**1,445**	**1,422**	**6,959**	**6,872**

Note: Numbers may not sum due to rounding.
Source: Boise 2010d.

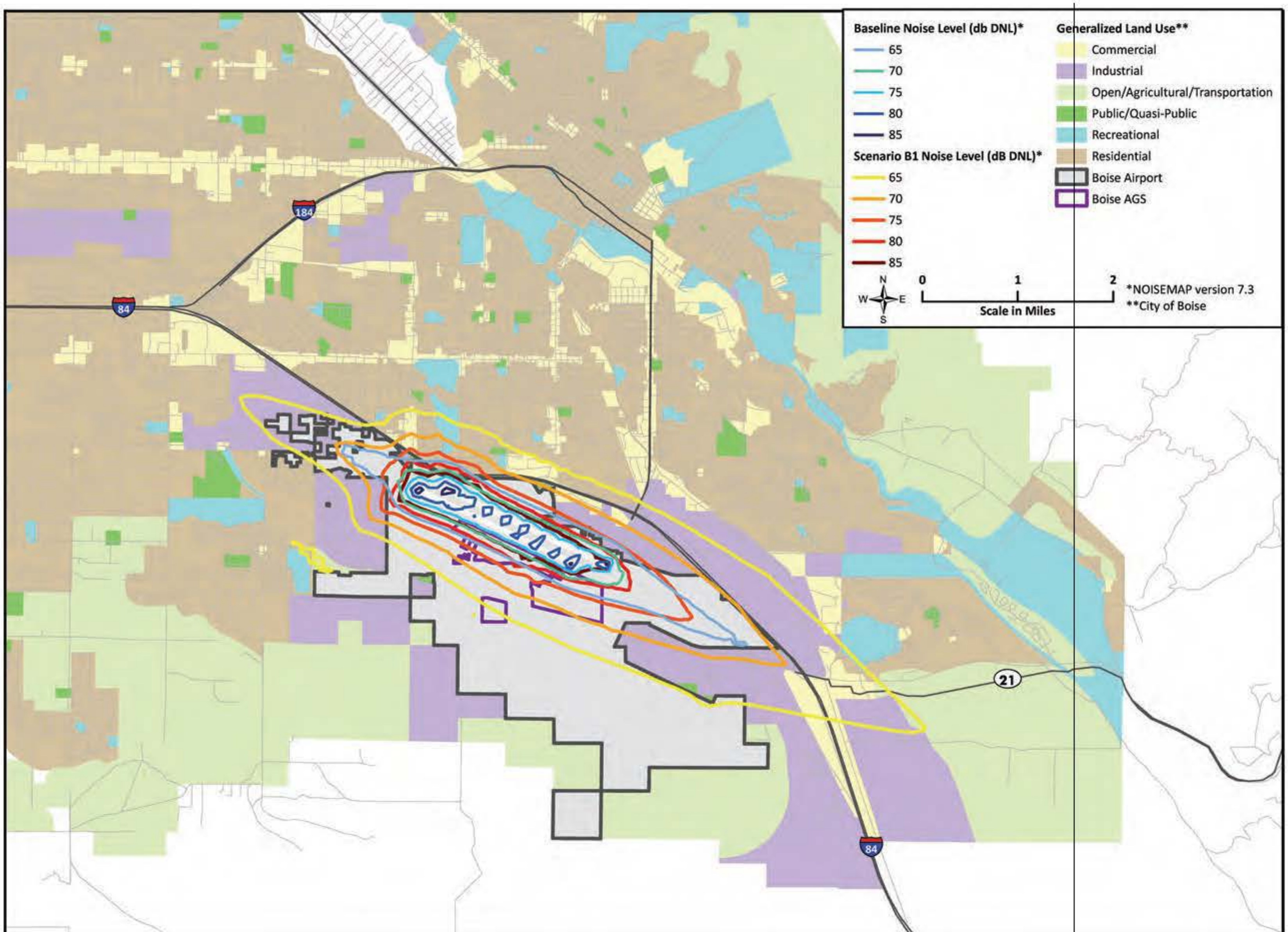


Figure BO 3.10–1. Scenario B1 and Baseline Land Use and Noise Contours in Areas Surrounding Boise AGS

Scenario B2. The F-35A training beddown would require additional construction for squadron operations, maintenance, and hangars, as well as the relocation of the Army National Guard from the south to the west ramp (see Table BO 2.1–2).

A discussion of projected on-base noise levels under Scenario B2 is presented in Section BO 3.2. Activities under Scenario B2 would increase the area surrounding Boise AGS within the 65 dB DNL or greater noise contour by 4,949 acres compared with baseline conditions (see Table BO 3.10–3 and Figure BO 3.10–2). The estimated number of persons affected by the projected increase in noise would be 5,329. The largest increase in acreage would be industrial, followed by residential, then other uses. The residential area is predominantly low-density (three to six dwelling units per acre), single-family development with some medium- to-high-density (15 to 43 dwelling units per acre) developments (Boise 1997).

Scenario B3. The F-35A training beddown would require additional construction for squadron operations, maintenance, and hangars, as well as the relocation of the Army National Guard from the south to the west ramp (see Table BO 2.1–2).

A discussion of projected on-base noise levels under Scenario B3 is presented in Section BO 3.2. Activities under Scenario B3 would increase the area surrounding Boise AGS within the 65 dB DNL or greater noise contour by 6,872 acres compared with baseline conditions (see Table BO 3.10–3 and Figure BO 3.10–3). The estimated number of persons affected by the projected increase in noise would be 9,977. The largest increase in acreage would be industrial, followed by residential, then other uses. The residential area is predominantly low-density (3 to 6 dwelling units per acre), single-family developments with some medium- to high-density (15 to 43 dwelling units per acre) developments (Boise 1997).

Recreation

Evaluation of recreational resources considers whether projected changes would preclude, displace, or alter the suitability of an area or facility for ongoing or planned recreational uses. A description of the methodology used and issues considered to evaluate impacts on recreation around airfields is provided in Chapter 3, Section 3.8.

Scenario B1. Construction for the F-35A beddown would take place on the south side of the airfield away from more densely developed parts of the city of Boise. Activities during construction would have little potential to directly affect surrounding recreational amenities.

About 2,100 additional personnel and family members would live within the Boise community as a result of Scenario B1. This new population would use parks and amenities in the city of Boise and surrounding areas. This could represent about a 1 percent increase in demand and use of public recreational amenities city-wide. Given the widespread recreational opportunities, both municipal and on public lands in the region, this should not affect the availability of recreational facilities for area residents. The City of Boise has an active program for planning and expanding park and recreational infrastructure to keep pace with recent population growth.

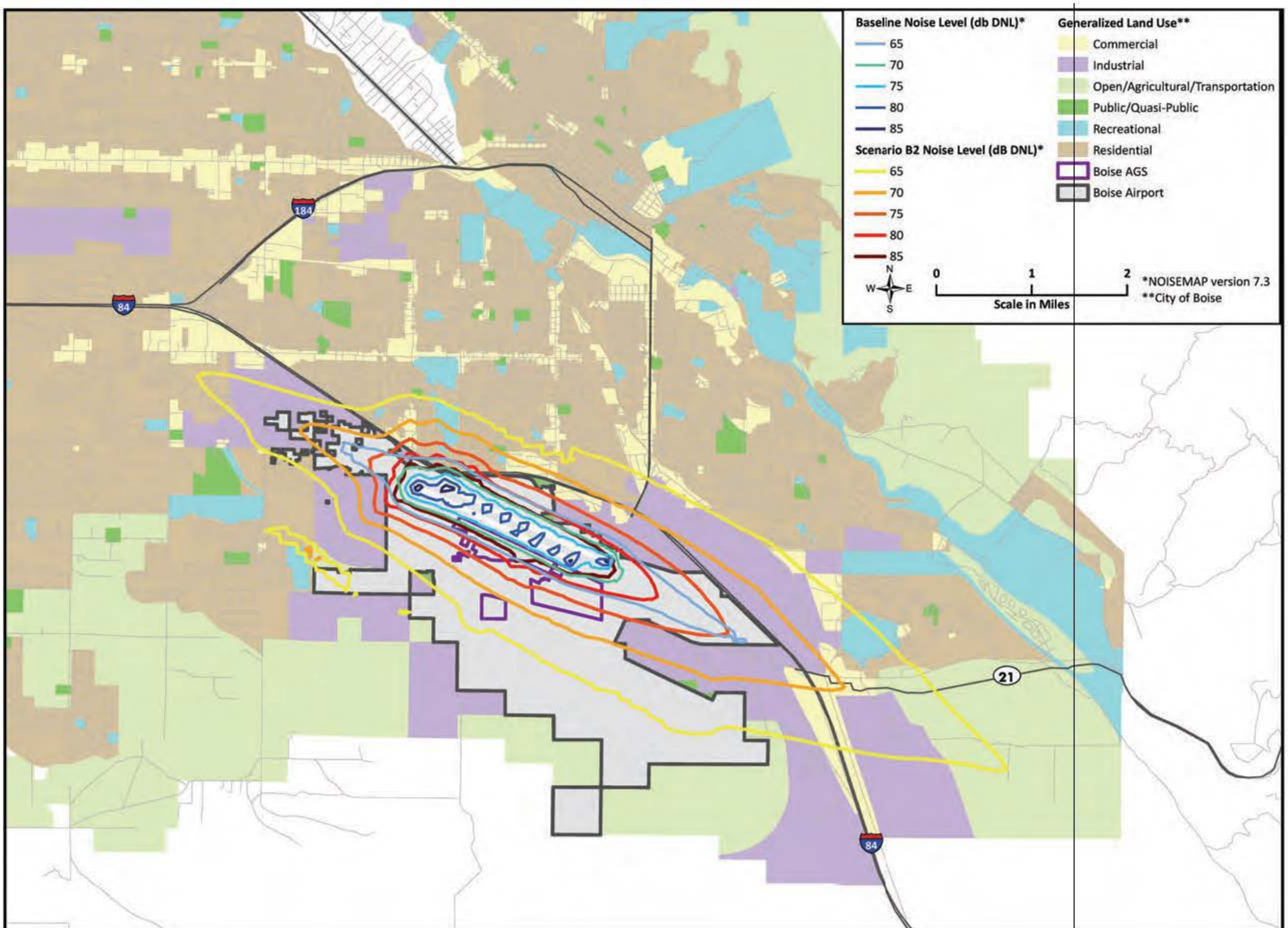


Figure BO 3.10–2. Scenario B2 and Baseline Land Use and Noise Contours in Areas Surrounding Boise AGS

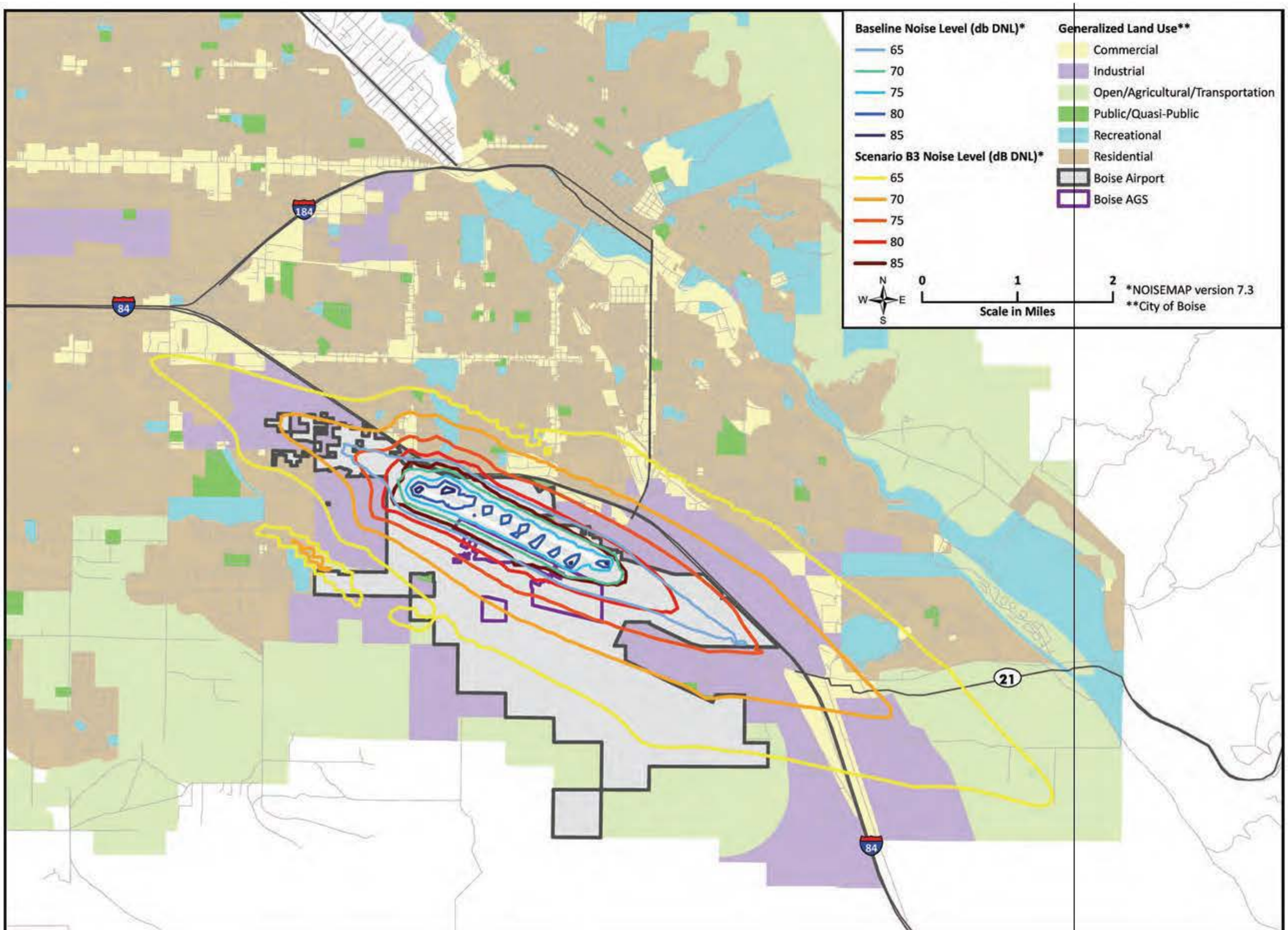


Figure BO 3.10–3. Scenario B3 and Baseline Land Use and Noise Contours in Areas Surrounding Boise AGS

Noise levels would increase at all recreational locations in the area immediately surrounding Boise AGS. Table BO 3.10–4 shows that currently none of the nearby local public and commercial recreational amenities are affected by noise levels above 65 dB DNL. Under Scenario B1, five locations would experience noise levels above 65 dB DNL. One park, Owyhee Neighborhood Park, would experience levels of 65 to 70 dB DNL. Park users may notice this change and may experience annoyance from interruptions during conversations, for example, but these levels are generally not incompatible with outdoor recreation. Two golf courses would experience noise levels above 65 dB DNL, with only a small portion of the fairway at Hillcrest Country Club experiencing incompatible levels above 80 dB DNL. The noise compatibility guidelines recommend that indoor facilities supporting or ancillary to outdoor amenities should have some level of sound attenuation where noise levels exceed 70 dB. Under Scenario B1, there are no indoor facilities meeting this threshold.

Table BO 3.10–4. Noise Effects on Recreational Amenities Around Boise AGS

	Average Noise Level (dB DNL)			
Recreational Amenity	**Baseline Conditions**	**Scenario B1 (24 Aircraft)**	**Scenario B2 (48 Aircraft)**	**Scenario B3 (72 Aircraft)**
New York Canal Path/Trail	N/A	65–80	65–80	65–80
Hillcrest Country Club (golf course)[1]	< 65	65–75	65–80	65–80
Idaho Ice World	< 65	65–70	65–75	70–75
Indian Lakes Public Golf Course[2]	< 65	65–70	65–70	65–70
Owyhee Neighborhood Park	< 65	65–70	70–75	70–75
Philippi Neighborhood Park	< 65	< 65	65–70	65–70
Shoshone Park	< 65	< 65	< 65	65–70
Simplot Sports Complex	< 65	< 65	65–70	65–75

[1] Clubhouse falls outside the 65 dB DNL noise contour under all F-35A aircraft scenarios. Portions of the golf course are exposed to 65 dB to 80 dB DNL under all F-35A aircraft scenarios.
[2] Applicable only to northeastern corner of golf course; majority of golf course falls under < 65 dB DNL conditions.
Source: Boise 2008b.

Idaho Ice World (an indoor facility) to the southeast of the runway would experience outdoor noise levels of 65 to 70 dB DNL from each departing F-35A aircraft during takeoff. These levels are generally compatible with indoor recreation. The Simplot Sports Complex would remain essentially outside the 65 dB DNL affected area. Noise during takeoff could be distracting and interfere with conversations and referee directions. Operations would likely be concentrated in batches throughout the day and evening. These facilities are slightly offset from the runway flight tracks, and therefore, are not in the high-risk zone for accidents from aircraft mishaps.

The proposed New York Canal trails and pathways fall within the area that would be affected by noise levels from 65 to 80 dB DNL to the northeast of the runway under all F-35A beddown scenarios at Boise AGS. These levels would be bothersome to some recreation users in the future.

During public review of the Draft EIS, commenters expressed concern for the impacts of aircraft noise on the Boise Shakespeare Festival. The outdoor amphitheater is over 4.5 miles from the airport. Aircraft arriving and departing from the airport would be audible at this site and could interfere with hearing performances. Mitigations discussed in Section 2.8 for Boise AGS could reduce the noise impacts to the outdoor amphitheater.

Scenario B2. An additional 3,768 personnel and family members would use recreational amenities in the city of Boise and surrounding area. This slight increase in population would represent a minimal increase in demand and use of facilities.

This aircraft scenario would result in the same effects as described for Scenario B1, with the added impact of slightly higher noise levels at the locations described above. A total of seven private and public recreational locations would experience noise levels above 65 dB DNL. Over half the Simplot Sports Complex would experience average noise levels of 65 to 70 dB DNL to the east of the airfield. This level of exposure is compatible with outdoor uses for soccer and baseball. However, F-35A overflight noise events could cause intermittent interference in speech and communication throughout the day, which could cause some annoyance or distraction of spectators and athletes at the sports complex. Most of the southern portion of the Hillcrest Country Club golf course would be exposed to levels above 70 dB DNL. The Idaho Ice World would experience noise levels of 65 to 75 dB DNL; following FAA guidelines, some level of outdoor-to-indoor sound attenuation would be appropriate.

Noise levels in Owyhee Neighborhood Park would increase to about 70 to 75 dB DNL making it somewhat less compatible for outside gathering. Similarly, Philippi Neighborhood Park would experience levels above 65 dB DNL under this scenario.

Scenario B3. An additional 5,431 personnel and family members would use recreational amenities in the city of Boise and surrounding area. This slight increase in population (of about 2 percent) would represent a moderate increase in demand and use of public and commercial facilities. Most of these would be younger families who are prone to use parks, trail systems, and developed recreational amenities. The City of Boise has an active program for planning and expanding park and recreational infrastructure to keep pace with population growth. It is anticipated that the city would continue to implement improvements and expansion of recreational plans to meet the needs of residents.

This aircraft scenario would have impacts similar to Scenarios B1 and B2, with an increase in the number of locations affected by noise levels above 65 dB DNL. Eight public and private recreational locations would be exposed to noise levels above 65 dB DNL. Outdoor activities are compatible with projected noise levels, although the quality of experience may further decline for some park users as noise levels increase with higher levels of operations. Under Scenario B3, Shoshone Park would experience levels above 65 dB DNL. Under Scenario B3, some level of sound attenuation would be appropriate for Idaho Ice World.

The sounds from individual aircraft operations would become more noticeable and annoying as frequency increases under this scenario. F-35A overflight events could cause intermittent interference in speech and communication throughout the day, which could cause some annoyance or distraction of spectators and athletes at the sports complex.

BO 3.10.2 Airspace

BO 3.10.2.1 Airspace Affected Environment

Land Use

This section summarizes land ownership and Special Use Land Management Areas (SULMAs) underlying the primary use airspace units associated with Boise AGS. SULMAs include selected areas managed by Federal and state agencies that provide recreational and scenic opportunities (e.g., parks, monuments, and scenic river corridors), solitude or a wilderness experience (e.g., forests and wilderness areas), conservation of natural or cultural resources (e.g., wildlife refuge areas and national monuments), and other special management functions (e.g., Native American reservation lands). SULMAs often provide a combination of the attributes listed above. Some SULMAs may include recreation-oriented sites such as campgrounds, trails, and visitor centers; recreation is addressed separately below.

The F-35A training mission would use airspace located within Oregon, Nevada, Utah, and Idaho, with most areas within Idaho (see Figures BO 2.2–1 and BO 3.10–4). The majority of Federal land under this airspace is administered by BLM, followed by USFS, the U.S. Bureau of Indian Affairs, DoD, the National Park Service, USFWS, and the U.S. Bureau of Reclamation.

Ninety-four SULMAs are located underneath one or more airspace units planned for use to support the F-35A mission at Boise AGS. The SULMAs and airspace are shown in Figure BO 3.10–4 and include wilderness areas and WSAs; wild and scenic rivers (WSRs); national forests; national wildlife refuges, reserves, and conservation areas; national recreation areas; national monuments and battlefields; reservoirs; state recreation areas; and Native American reservation lands. Baseline subsonic noise levels associated with the different airspace units and SULMAs are identified in Table BO 3.10–5.

Supersonic operations are authorized in the Saylor Creek Range, Jarbidge North/South MOAs/ATCAAs, Owyhee North/South MOAs/ATCAAs, and Paradise North/South ATCAAs. Baseline supersonic noise levels and the number of sonic booms per day for each of these airspace units are shown in Tables BO 3.10–6 and 3.10–7, respectively.

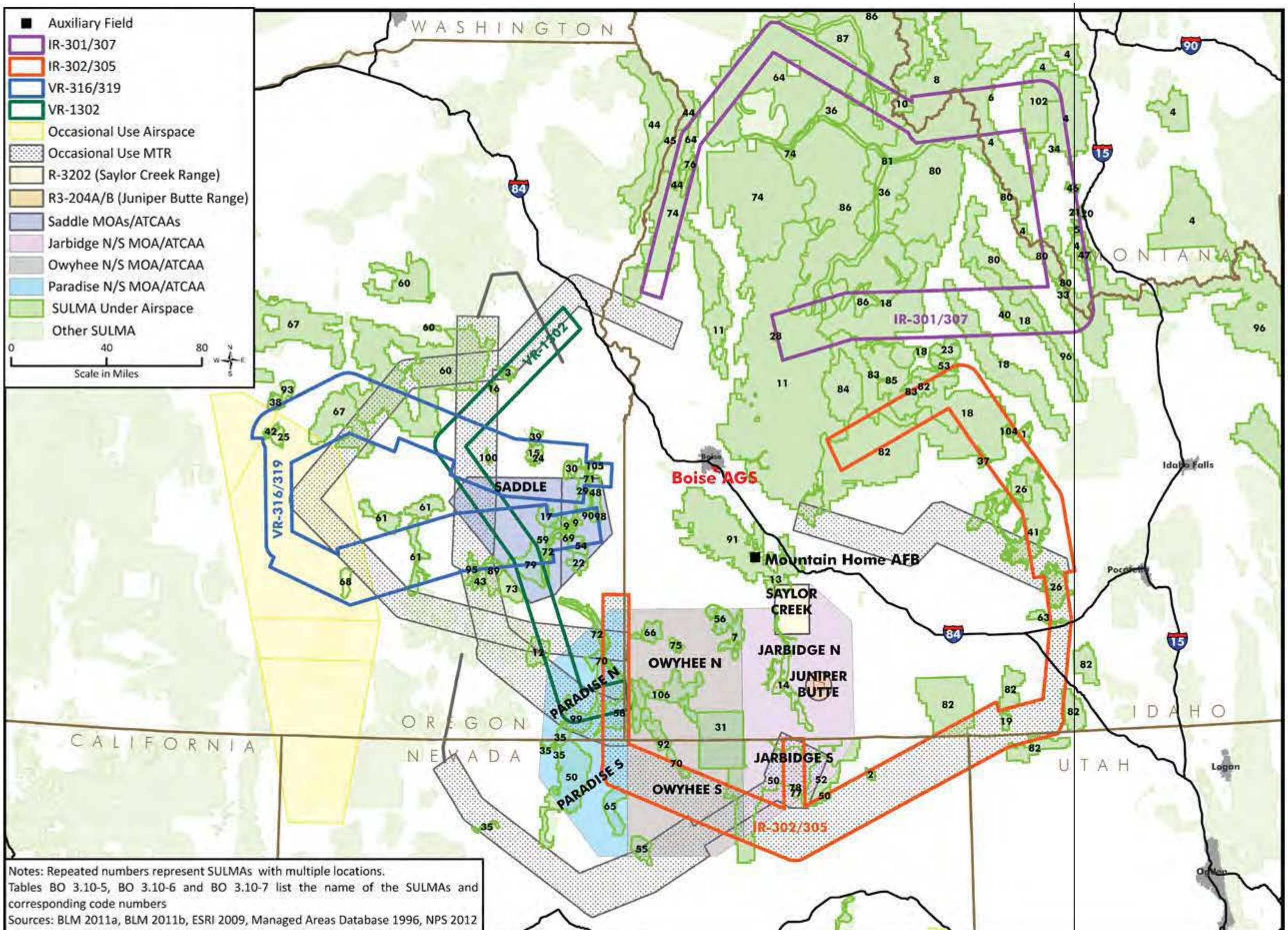


Figure BO 3.10–4. SULMAs and Airspace for Boise AGS, Idaho

Table BO 3.10–5. Subsonic Noise Levels (DNL_{mr}) by Airspace and Associated SULMAs for Boise AGS Primary Use Airspace, Baseline Conditions and F-35A Beddown Scenarios

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario (No. of Aircraft)					
					B1 (24)		B2 (48)		B3 (72)	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
IR-301/307										
4	Beaverhead National Forest	1,769,704	24	64	66	2	66	2	67	3
5	Bell/Limekiln Canyons WSA	11,370	99	64	66	2	66	2	67	3
6	Big Hole National Battlefield	671	100	64	66	2	66	2	67	3
8	Bitterroot National Forest	861,490	17	64	66	2	66	2	67	3
10	Blue Joint WSA	30,095	85	64	66	2	66	2	67	3
11	Boise National Forest	2,464,011	9	64	66	2	66	2	67	3
18	Challis National Forest	1,746,203	35	64	66	2	66	2	67	3
20	Clark Canyon Reservoir	4,976	23	64	66	2	66	2	67	3
21	Clark Canyon State Recreation Area	11,293	32	64	66	2	66	2	67	3
23	Corral-Horse Basin WSA	50,887	< 1	64	66	2	66	2	67	3
28	Deadwood Reservoir	2,911	23	64	66	2	66	2	67	3
33	Eighteen Mile WSA	25,072	100	64	66	2	66	2	67	3
34	Farlin Creek WSA	1,664	100	64	66	2	66	2	67	3
36	Frank Church-River of No Return Wilderness Area	449,878	< 1	64	66	2	66	2	67	3
40	Goldburg WSA	4,062	100	64	66	2	66	2	67	3
44	Hells Canyon National Recreation Area	410,129	< 1	64	66	2	66	2	67	3
45	Hells Canyon Wilderness Area	226,622	19	64	66	2	66	2	67	3
46	Henneberry Bridge WSA	10,713	67	64	66	2	66	2	67	3
47	Hidden Pasture Creek WSA	14,415	36	64	66	2	66	2	67	3
64	Nez Perce National Forest	1,273,296	46	64	66	2	66	2	67	3
74	Payette National Forest	1,627,704	14	64	66	2	66	2	67	3
76	Rapid WSR	26,605	100	64	66	2	66	2	67	3
80	Salmon National Forest	1,360,149	24	64	66	2	66	2	67	3
81	Salmon WSR	289,591	2	64	66	2	66	2	67	3
83	Sawtooth National Recreation Area	303,503	8	64	66	2	66	2	67	3
86	Selway WSR	87,925	18	64	66	2	66	2	67	3
87	Selway-Bitterroot Wilderness Area	3,161,935	9	64	66	2	66	2	67	3
96	Targhee National Forest	1,542,672	3	64	66	2	66	2	67	3
102	West Pioneer Mountains WSA	205,722	81	64	66	2	66	2	67	3
IR-302/305										
1	Appendicitis Hill WSA	25,583	23	65	66	1	67	2	68	3
2	Badlands WSA	40,627	19	65	66	1	67	2	68	3
11	Boise National Forest	2,464,011	1	65	66	1	67	2	68	3
18	Challis National Forest	1,746,203	22	65	66	1	67	2	68	3
19	City of Rocks National Reserve	14,538	100	65	66	1	67	2	68	3
26	Craters of the Moon National Monument	469,730	68	65	66	1	67	2	68	3
37	Friedman Creek WSA	9,864	31	65	66	1	67	2	68	3
41	Great Rift WSA	38,762	75	65	66	1	67	2	68	3
50	Humboldt National Forest	2,085,156	11	65	66	1	67	2	68	3
52	Jarbidge Wilderness Area	110,541	3	65	66	1	67	2	68	3

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario (No. of Aircraft)					
					B1 (24)		B2 (48)		B3 (72)	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
53	Jerry Peak WSA	46,443	27	65	66	1	67	2	68	3
58	Lookout Butte WSA	103,396	78	65	66	1	67	2	68	3
63	Minidoka NWR	24,711	23	65	66	1	67	2	68	3
65	North Fork of the Little Humboldt River WSA	68,032	1	65	66	1	67	2	68	3
70	Owyhee Canyon WSA	211,076	46	65	66	1	67	2	68	3
72	Owyhee WSR	91,167	29	65	66	1	67	2	68	3
77	Rough Hills WSA	5,578	100	65	66	1	67	2	68	3
78	Rough Hills WSA	1,294	100	65	66	1	67	2	68	3
82	Sawtooth National Forest	1,551,885	23	65	66	1	67	2	68	3
83	Sawtooth National Recreation Area	303,503	17	65	66	1	67	2	68	3
84	Sawtooth Wilderness Area	215,510	< 1	65	66	1	67	2	68	3
85	Sawtooth WSA	234,249	26	65	66	1	67	2	68	3
104	White Knob Mountains WSA	10,097	100	65	66	1	67	2	68	3
R-3202 Saylor Creek Range										
13	Bruneau Dunes State Park	2,795	3	64	65	1	66	2	67	3
14	Bruneau-Jarbidge River Wilderness	89,821	3	64	65	1	66	2	67	3
91	Snake River Birds of Prey NCA	598,026	2	64	65	1	66	2	67	3
Jarbidge North MOA/ATCAA										
14	Bruneau-Jarbidge River Wilderness	89,821	97	64	65	1	66	2	67	3
31	Duck Valley Indian Reservation	288,597	1	64	65	1	66	2	67	3
Jarbidge South MOA/ATCAA										
31	Duck Valley Indian Reservation	288,597	2	< 45	< 45	0	< 45	0	< 45	0
50	Humboldt National Forest	2,085,156	22	< 45	< 45	0	< 45	0	< 45	0
52	Jarbidge Wilderness Area	110,541	62	< 45	< 45	0	< 45	0	< 45	0
77	Rough Hills WSA	5,578	100	< 45	< 45	0	< 45	0	< 45	0
78	Rough Hills WSA	1,294	100	< 45	< 45	0	< 45	0	< 45	0
Owyhee North MOA/ATCAA										
7	Big Jacks Creek Wilderness	52,718	92	64	65	1	65	1	66	2
31	Duck Valley Indian Reservation	288,597	48	64	65	1	65	1	66	2
56	Little Jacks Creek WSA	51,526	92	64	65	1	65	1	66	2
66	North Fork Owyhee Wilderness	44,021	100	64	65	1	65	1	66	2
75	Pole Creek Wilderness	12,547	100	64	65	1	65	1	66	2
106	Owyhee River Wilderness	267,161	94	< 45	< 45	0	< 45	0	< 45	0
Owyhee South MOA/ATCAA										
31	Duck Valley Indian Reservation	288,597	49	< 45	< 45	0	< 45	0	< 45	0
50	Humboldt National Forest	2,085,156	4	< 45	< 45	0	< 45	0	< 45	0
55	Little Humboldt River WSA	43,020	82	< 45	< 45	0	< 45	0	< 45	0
70	Owyhee Canyon WSA	211,076	10	< 45	< 45	0	< 45	0	< 45	0
106	Owyhee River Wilderness	267,161	< 1	< 45	< 45	0	< 45	0	< 45	0
92	South Fork Owyhee River WSA	13,571	100	< 45	< 45	0	< 45	0	< 45	0
Paradise North MOA/ATCAA										
35	Fort McDermitt Indian Reservation	42,797	44	< 45	< 45	0	< 45	0	< 45	0
70	Owyhee Canyon WSA	211,076	77	< 45	< 45	0	< 45	0	< 45	0

SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	*Baseline Conditions*	*Scenario (No. of Aircraft)*					
					B1 (24)		*B2 (48)*		*B3 (72)*	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
106	Owyhee River Wilderness	267,161	6	< 45	< 45	0	< 45	0	< 45	0
72	Owyhee WSR	91,167	39	< 45	< 45	0	< 45	0	< 45	0
Paradise South MOA/ATCAA										
35	Fort McDermitt Indian Reservation	42,797	31	< 45	< 45	0	< 45	0	< 45	0
50	Humboldt National Forest	2,085,156	10	< 45	< 45	0	< 45	0	< 45	0
65	North Fork of the Little Humboldt River WSA	68,032	100	< 45	< 45	0	< 45	0	< 45	0
Saddle A MOA/ATCAA										
9	Blue Canyon WSA	17,923	100	< 45	49	4	51	6	53	8
22	Clarks Butte WSA	31,243	75	< 45	49	4	51	6	53	8
29	Dry Creek Buttes WSA	49,048	77	< 45	49	4	51	6	53	8
30	Dry Creek WSA	23,763	2	< 45	49	4	51	6	53	8
48	Honeycombs WSA	40,196	89	< 45	49	4	51	6	53	8
54	Jordan Craters WSA	29,711	100	< 45	49	4	51	6	53	8
59	Lower Owyhee Canyon WSA	73,730	8	< 45	49	4	51	6	53	8
69	Owyhee Breaks WSA	7,753	98	< 45	49	4	51	6	53	8
71	Owyhee Reservoir	11,685	57	< 45	49	4	51	6	53	8
72	Owyhee WSR	91,167	8	< 45	49	4	51	6	53	8
90	Slocum Creek WSA	8,778	100	< 45	49	4	51	6	53	8
98	Upper Leslie Gulch WSA	4,281	100	< 45	49	4	51	6	53	8
Saddle B MOA/ATCAA										
9	Blue Canyon WSA	17,923	< 1	< 45	49	4	51	6	53	8
17	Cedar Mountain WSA	34,509	100	< 45	49	4	51	6	53	8
43	Heath Lake WSA	29,085	6	< 45	49	4	51	6	53	8
59	Lower Owyhee Canyon WSA	73,730	92	< 45	49	4	51	6	53	8
69	Owyhee Breaks WSA	7,753	2	< 45	49	4	51	6	53	8
72	Owyhee WSR	91,167	27	< 45	49	4	51	6	53	8
73	Palomino Hills WSA	53,073	3	< 45	49	4	51	6	53	8
79	Saddle Butte WSA	89,639	100	< 45	49	4	51	6	53	8
89	Sheepshead Mountains WSA	44,539	2	< 45	49	4	51	6	53	8
VR-1302										
3	Beaver Dam Creek WSA	18,152	90	< 45	< 45	0	46	1	48	3
12	Bowden Hills WSA	57,854	27	< 45	< 45	0	46	1	48	3
16	Castle Rock WSA	6,234	100	< 45	< 45	0	46	1	48	3
58	Lookout Butte WSA	103,396	32	< 45	< 45	0	46	1	48	3
59	Lower Owyhee Canyon WSA	73,730	11	< 45	< 45	0	46	1	48	3
70	Owyhee Canyon WSA	211,076	32	< 45	< 45	0	46	1	48	3
72	Owyhee WSR	91,167	2	< 45	< 45	0	46	1	48	3
79	Saddle Butte WSA	89,639	90	< 45	< 45	0	46	1	48	3
106	Owyhee River Wilderness	267,161	3	< 45	< 45	0	46	1	48	3
99	Upper West Little Owyhee WSA	61,906	57	< 45	< 45	0	46	1	48	3
VR-316/319										
9	Blue Canyon WSA	17,923	100	53	55	2	57	4	58	5
15	Camp Creek WSA	20,161	100	53	55	2	57	4	58	5
17	Cedar Mountain WSA	34,509	86	53	55	2	57	4	58	5
24	Cottonwood Creek WSA	8,483	100	53	55	2	57	4	58	5

SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	*Baseline Conditions*	*Scenario (No. of Aircraft)*					
					B1 (24)		*B2 (48)*		*B3 (72)*	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
25	Cougar Well WSA	19,481	100	53	55	2	57	4	58	5
29	Dry Creek Buttes WSA	49,048	61	53	55	2	57	4	58	5
30	Dry Creek WSA	23,763	100	53	55	2	57	4	58	5
38	Gerry Mountain WSA	21,855	16	53	55	2	57	4	58	5
39	Gold Creek WSA	16,515	21	53	55	2	57	4	58	5
42	Hampton Butte WSA	10,025	100	53	55	2	57	4	58	5
43	Heath Lake WSA	29,085	34	53	55	2	57	4	58	5
48	Honeycombs WSA	40,196	39	53	55	2	57	4	58	5
54	Jordan Craters WSA	29,711	50	53	55	2	57	4	58	5
59	Lower Owyhee Canyon WSA	73,730	82	53	55	2	57	4	58	5
60	Malheur National Forest	1,213,503	24	53	55	2	57	4	58	5
61	Malheur NWR	188,433	28	53	55	2	57	4	58	5
67	Ochoco National Forest	947,750	20	53	55	2	57	4	58	5
68	Orejana Canyon WSA	24,172	100	53	55	2	57	4	58	5
69	Owyhee Breaks WSA	7,753	100	53	55	2	57	4	58	5
71	Owyhee Reservoir	11,685	46	53	55	2	57	4	58	5
72	Owyhee WSR	91,167	25	53	55	2	57	4	58	5
79	Saddle Butte WSA	89,639	51	53	55	2	57	4	58	5
89	Sheepshead Mountains WSA	44,539	18	53	55	2	57	4	58	5
90	Slocum Creek WSA	8,778	99	53	55	2	57	4	58	5
93	South Fork WSA	23,372	1	53	55	2	57	4	58	5
95	Stonehouse WSA	23,682	53	53	55	2	57	4	58	5
98	Upper Leslie Gulch WSA	4,281	8	53	55	2	57	4	58	5
100	Warm Springs Reservoir	3,633	100	53	55	2	57	4	58	5
105	Wild Horse Basin WSA	13,932	78	53	55	2	57	4	58	5

Key: NWR=national wildlife refuge.
Sources: BLM 2011a; BLM 2011b; ESRI 2009; Managed Areas Database 1996; NPS 2012.

Table BO 3.10–6. Supersonic Noise Levels (CDNL) by Airspace and Associated SULMAs for Boise AGS Primary Use Airspace, Baseline Conditions and F-35A Beddown Scenarios

				Baseline Conditions	*Scenario (No. of Aircraft)*					
					B1 (24)		*B2 (48)*		*B3 (72)*	
SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	CDNL	CDNL	Change	CDNL	Change	CDNL	Change
Jarbidge North MOA										
14	Bruneau-Jarbidge Rivers Wilderness	898,219	97	53	54	1	54	1	54	1
31	Duck Valley Indian Reservation	288,597	1	53	54	1	54	1	54	1
R-3202 Saylor Creek Range										
13	Bruneau Dunes State Park	2,795	3	53	54	1	54	1	54	1
14	Bruneau-Jarbidge Rivers Wilderness	89,821	3	53	54	1	54	1	54	1
91	Snake River Birds of Prey NCA	598,026	2	53	54	1	54	1	54	1
Jarbidge South ATCAA										
31	Duck Valley Indian Reservation	288,597	2	48	48	0	48	0	48	0
50	Humboldt National Forest	2,085,156	22	48	48	0	48	0	48	0
52	Jarbidge Wilderness Area	110,541	62	48	48	0	48	0	48	0
77	Rough Hills WSA	5,578	100	48	48	0	48	0	48	0
78	Rough Hills WSA	1,294	100	48	48	0	48	0	48	0
Owyhee North MOA										
7	Big Jacks Creek Wilderness	52,684	92	57	57	0	57	0	57	0
31	Duck Valley Indian Reservation	288,597	48	57	57	0	57	0	57	0
56	Little Jacks Creek Wilderness	51,526	92	57	57	0	57	0	57	0
66	North Fork Owyhee Wilderness	44,021	100	57	57	0	57	0	57	0
75	Pole Creek Wilderness	12,547	100	57	57	0	57	0	57	0
106	Owyhee River Wilderness	267,161	94	57	57	0	57	0	57	0
Owyhee South ATCAA										
31	Duck Valley Indian Reservation	288,597	49	48	48	0	48	0	48	0
50	Humboldt National Forest	2,085,156	4	48	48	0	48	0	48	0
55	Little Humboldt River WSA	43,020	82	48	48	0	48	0	48	0
70	Owyhee Canyon WSA	211,076	10	48	48	0	48	0	48	0
106	Owyhee River Wilderness	267,161	< 1	48	48	0	48	0	48	0
92	South Fork Owyhee River WSA	13,571	100	48	48	0	48	0	48	0
Paradise North ATCAA										
35	Fort McDermitt Indian Reservation	42,797	44	48	48	0	48	0	48	0
70	Owyhee Canyon WSA	211,076	77	48	48	0	48	0	48	0
106	Owyhee River Wilderness	267,161	6	48	48	0	48	0	48	0
72	Owyhee WSR	91,167	39	48	48	0	48	0	48	0
Paradise South ATCAA										
35	Fort McDermitt Indian Reservation	42,797	31	48	48	0	48	0	48	0
50	Humboldt National Forest	2,085,156	10	48	48	0	48	0	48	0
65	North Fork of the Little Humboldt River WSA	68,032	100	48	48	0	48	0	48	0

Table BO 3.10–7. Sonic Booms per Day by Airspace and Associated SULMAs for Boise AGS Primary Use Airspace, Baseline Conditions and F-35A Beddown Scenarios

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions Booms/Day	B1 (24) Booms/Day	B1 (24) Change	B2 (48) Booms/Day	B2 (48) Change	B3 (72) Booms/Day	B3 (72) Change
Jarbidge North MOA										
14	Bruneau-Jarbidge Rivers Wilderness	898,219	97	2.0	2.1	0.1	2.2	0.2	2.4	0.4
31	Duck Valley Indian Reservation	288,597	1	2.0	2.1	0.1	2.2	0.2	2.4	0.4
R-3202 Saylor Creek Range										
13	Bruneau Dunes State Park	2,795	3	2.0	2.1	0.1	2.2	0.2	2.4	0.4
14	Bruneau-Jarbidge Rivers Wilderness	89,821	3	2.0	2.1	0.1	2.2	0.2	2.4	0.4
91	Snake River Birds of Prey NCA	598,026	2	2.0	2.1	0.1	2.2	0.2	2.4	0.4
Jarbidge South ATCAA										
31	Duck Valley Indian Reservation	288,597	2	0.6	0.6	0	0.6	0	0.6	0
50	Humboldt National Forest	2,085,156	22	0.6	0.6	0	0.6	0	0.6	0
52	Jarbidge Wilderness Area	110,541	62	0.6	0.6	0	0.6	0	0.6	0
77	Rough Hills WSA	5,578	100	0.6	0.6	0	0.6	0	0.6	0
78	Rough Hills WSA	1,294	100	0.6	0.6	0	0.6	0	0.6	0
Owyhee North MOA										
7	Big Jacks Creek Wilderness	52,684	92	1.9	2.0	0.1	2.1	0.2	2.2	0.3
31	Duck Valley Indian Reservation	288,597	48	1.9	2.0	0.1	2.1	0.2	2.2	0.3
56	Little Jacks Creek Wilderness	51,526	92	1.9	2.0	0.1	2.1	0.2	2.2	0.3
66	North Fork Owyhee Wilderness	44,021	100	1.9	2.0	0.1	2.1	0.2	2.2	0.3
75	Pole Creek Wilderness	12,547	100	1.9	2.0	0.1	2.1	0.2	2.2	0.3
106	Owyhee River Wilderness	267,161	94	1.9	2.0	0.1	2.1	0.2	2.2	0.3
Owyhee South ATCAA										
31	Duck Valley Indian Reservation	288,597	49	0.6	0.6	0	0.6	0	0.6	0
50	Humboldt National Forest	2,085,156	4	0.6	0.6	0	0.6	0	0.6	0
55	Little Humboldt River WSA	43,020	82	0.6	0.6	0	0.6	0	0.6	0
70	Owyhee Canyon WSA	211,076	10	0.6	0.6	0	0.6	0	0.6	0
106	Owyhee River Wilderness	267,161	< 1	0.6	0.6	0	0.6	0	0.6	0
92	South Fork Owyhee River WSA	13,571	100	0.6	0.6	0	0.6	0	0.6	0
31	Duck Valley Indian Reservation	288,597	49	0.6	0.6	0	0.6	0	0.6	0
Paradise North ATCAA										
35	Fort McDermitt Indian Reservation	42,797	44	0.6	0.6	0	0.6	0	0.6	0
70	Owyhee Canyon WSA	211,076	77	0.6	0.6	0	0.6	0	0.6	0
106	Owyhee River Wilderness	267,161	6	0.6	0.6	0	0.6	0	0.6	0
72	Owyhee WSR	91,167	39	0.6	0.6	0	0.6	0	0.6	0
Paradise South ATCAA										
35	Fort McDermitt Indian Reservation	42,797	31	0.6	0.6	0	0.6	0	0.6	0
50	Humboldt National Forest	2,085,156	10	0.6	0.6	0	0.6	0	0.6	0
65	North Fork of the Little Humboldt River WSA	68,032	100	0.6	0.6	0	0.6	0	0.6	0

Sources: BLM 2011a; BLM 2011b; ESRI 2009; Managed Areas Database 1996; NPS 2012.

Auxiliary Airfield

Mountain Home AFB. The Mountain Home AFB AICUZ (Mountain Home AFB 2006) Program provides the base and surrounding communities with guidelines to address noise issues in land planning. As part of its AICUZ Program, Mountain Home AFB established noise contours, as well as a CZ and two APZs, at the end of each runway. Land uses within the AICUZ noise contours are primarily agricultural. None of the areas within the noise contours of 65 dB DNL or greater contain incompatible land uses (ACC 2007). The CZs, both of which extend off base, include neither housing nor other incompatible land uses. The Air Force also holds real property rights to off-base portions of CZs to prevent incompatible land uses. Within APZs, dense residential development or other land uses that promote public assembly are discouraged. Land uses allowed within APZ I include a variety of industrial, open space, and agricultural uses, whereas APZ II land uses include all of those listed for APZ I, as well as some additional commercial uses and services (ACC 2007). Within APZs, as well as the portions of CZs that lie outside the base, agriculture (i.e., cultivation and grazing) is the predominant land use. For APZs extending from the northwest end of the runway, the area consists of private lands and lands administered by BLM. To the southeast end of the runway, the area within the APZs is solely composed of BLM lands.

Elmore County has regulations and ordinances that specifically address land use and zoning near Mountain Home AFB. The specific regulations and ordinances are contained in the Elmore County Comprehensive Plan and zoning ordinances.

Elmore County's Zoning and Development Ordinance addresses zoning for all airports within Elmore County, including Mountain Home AFB. The Zoning and Development Ordinance is consistent with the recommendations contained in the Mountain Home AFB AICUZ report. The ordinance established an Airport Hazard Zone for Mountain Home AFB that protects the base from incompatible land use encroachment (Elmore County 2007). Sub-zones were also created within the Airport Hazard Zone that limit and regulate structure heights and objects of natural growth. Commercial development along Airbase Road is within the ordinance-designated Airport Commercial Zone.

<u>On-Base Land Use.</u> Mountain Home AFB comprises approximately 6,844 acres (ACC 2007) and is managed by the 366th Fighter Wing (366 FW) under Air Combat Command. Within the base, nearly 5 million square feet of facilities associated with military operations cover about 30 percent of the land area. The runway complex bisects the base from the northwest to the southeast. Lands to the southwest are largely undeveloped, with the exception of the wastewater treatment facility. The most intensively developed portions of the base are the south-central and northeastern areas, where the runway complex and maintenance and administration facilities are located. Community facilities, including schools, medical facilities, and housing, are located to the northeast, while administrative and operational facilities are located near the center and along the flightline (ACC 2007).

The city of Mountain Home is the largest community in the vicinity of the base. Land ownership in the area immediately surrounding the base reflects a roughly equal mixture of private lands in unincorporated areas of Elmore County and BLM lands. Land use consists primarily of agriculture and grazing, although scattered residences occur.

Surrounding Land Use. Mountain Home AFB provides off-base and nearby support functions for Boise AGS and would support the F-35A mission at Boise AGS as an auxiliary base. It is located in southwestern Idaho in Elmore County, approximately 50 miles southeast of Boise. Owyhee County is approximately 4 miles south of the base, and Ada County is about 7 miles to the northwest. The cities of Mountain Home, located approximately 10 miles northeast of the base, and Glenns Ferry, located 30 miles southeast of the base, are the only two incorporated communities in Elmore County. The Federal Government dominates land ownership in Elmore County, with USFS, BLM, and DoD owning more than 70 percent of Elmore County lands.

Areas within the vicinity of Mountain Home AFB affected by noise contour levels of 65 dB DNL or greater are shown in Figures BO 3.2–5 through BO 3.2–7. The existing noise environment at Mountain Home AFB is discussed further in Section BO 3.2.

Recreation

The aircraft based at Boise AGS would use the same airspace that supports MHRC. Much of the underlying land is under BLM or USFS management, which allows general access for a variety of outdoor recreational uses. Many areas under the airspace are specially designated and managed for particular resource qualities, many of which have recreational value. Developed sites are located throughout Federal and state lands that support recreation, such as trails, parks, campgrounds, and off-road areas. Undeveloped and remote areas can provide solitude and pristine outdoor experiences (parks, forests, wilderness areas and WSAs, WSRs).

Wilderness areas and WSAs, managed under the Wilderness Act of 1964, fulfill a recreational purpose. The act directed Federal land management agencies to evaluate and designate wilderness areas meeting certain criteria. These criteria include naturalness, opportunity for solitude, primitive and unconfined recreation, special features, size, and, in some cases, visual quality. The law also directed that these areas be managed to preserve these qualities with an absence of motorized equipment, structures, and roads.

BLM, under the Federal Land Policy and Management Act, and USFS reviewed Federal land and identified suitable WSAs. These areas must be managed like wilderness until Congress either formally designates a proposed wilderness or removes it from further wilderness consideration. Similarly, the Wild and Scenic Rivers Act outlines values and criteria for designating rivers for special protection. These values include scenic, recreation, geology, fish and wildlife, historic, or cultural. Wild rivers are also inaccessible except by water, foot, or horseback. Designated stretches of river are managed like wilderness areas to minimize the imprint of man and to preserve wild character.

Table BO 3.10–5 lists the SULMAs and areas with recreational value underlying airspace affected by this action at this location. The affected area overlaps with portions of 10 wilderness areas and over 50 WSAs. The study area includes over 20 sections of WSRs along the Owyhee, Salmon, Selway, and Rapid Rivers in Oregon and Idaho.

BLM and USFS lands (with portions of 12 national forests) and a limited amount of state-owned land provide a spectrum of recreational opportunities, from the challenges of remote hiking and camping in non-motorized areas, to those of biking and riding motorized off-road vehicles on special trails and courses. The landscape supports passive experiences, such as nature viewing,

and more-active pursuits, such as hunting, fishing, river rafting, and kayaking, off-road sports, and winter sports. The underlying area has developed sites, including campgrounds and picnic areas; pedestrian, horse, and bike trails; ski trails and areas; and motorized vehicle trails.

Hunting is very popular, with good opportunities for big game (such as deer, elk, antelope, sheep, wolf, and moose) and upland game species, with a notable restricted hunt for California bighorn sheep in the Jacks Creek and Owyhee River areas. Waterfowl and furbearing animals are also hunted. Motorized vehicles and all-terrain vehicles use existing roads and designated routes for hunting access. Other recreational opportunities include visiting parks, one state park, two national monuments, cultural sites (such as historic trails and one national battlefield site), four reservoirs, and one state and two national recreation areas within the affected area, providing important opportunities and locations for vacationing families and individuals. Two national wildlife refuges (Minidoka and Malheur) serve a conservation purpose and also provide excellent conditions for viewing wildlife and nature.

Auxiliary Airfield

Mountain Home AFB. Mountain Home AFB, which is an auxiliary airfield for Boise AGS F-35A aircraft, has a golf course, baseball fields, paintball area, skeet-shooting range, and other outdoor recreational facilities (such as basketball and swimming) for use by base personnel and family members. The C.J. Strike Dam Recreation Annex, located approximately 8 miles southwest of Mountain Home AFB, is an outdoor recreational facility available to base and other military personnel and offers boating, fishing, hiking, and other activities (Mountain Home AFB 2004). Portions of Saylor Creek Range, approximately 12 miles southeast of the base, also support some outdoor recreational activities. Bruneau Dunes State Park, which offers fishing, hiking, camping, and swimming, is located approximately 10 miles southeast of the base (Idaho Parks and Recreation 2010).

BO 3.10.2.2 Airspace Environmental Consequences

Land Use

Safety guidelines and existing range management and land use plans would be updated to address F-35A operations, as necessary. Noise exposure associated with F-35A operations within the airspace is discussed further in Section BO 3.2.

Noise compatibility considerations may differ for various types of SULMAs. Recreational areas, for example, vary in the degree to which quiet is desirable and necessary for a high-quality recreation experience; how much of an area is devoted to developed and undeveloped recreation and the remoteness of an area are also factors. Managers of wildlife areas and preserves frequently consider sensitivity of wildlife to noise, such as startle effects due to sudden changes in noise. Noise impacts on recreation and wildlife are addressed separately in the Recreation section below and in Sections BO 3.6, BO 3.7, and BO 3.8.

Noise modeled for each individual airspace unit was evaluated using GIS techniques to determine if there would be land use impacts on SULMAs located wholly or partially underneath the airspace. For SULMAs that are partially under airspace, noise in areas adjacent to airspace tends to fall off dramatically, particularly because pilots typically fly closer to the

center of the airspace. The airspace noise modeling reflects this by tapering the density of operations down toward the edge of a MOA, for example. In other cases, a SULMA may be located underneath more than one airspace unit or airspace units that overlap each other, for example, a MOA that overlaps an MTR. The experience of MTR overflight is fairly different from MOA overflight. MTR overflights are fast, low, and typically single events, while MOA overflights occur at higher altitudes and are potentially repeated. Note that differences in instantaneous noise levels of less than 3 dB are typically imperceptible to persons with normal hearing in non-laboratory settings. Section BO 3.2 discusses noise characteristics and the different noise metrics in greater detail.

Sonic boom noise within the airspace is quite different from subsonic noise, which may occur in the same airspace, although both can cause annoyance. Sonic booms experienced in SULMAs could startle or disturb public recreation users and/or wildlife.

Tables BO 3.10–5 through BO 3.10–7 display the projected incremental changes to subsonic noise levels, supersonic noise levels, and daily sonic booms in individual airspace units and associated SULMAS under each F-35A scenario.

The vast majority of noise from air-to-ground or ground-to-ground use of ranges for projected F-35A munitions training was assumed to occur within the ranges themselves and would have negligible effects on SULMAs and other land uses outside the ranges.

Scenario B1. Under Scenario B1, the projected F-35A training exercises would result in increases in subsonic airspace noise ranging from 1 dB to 4 dB DNL_{mr}. The noise level would be at or below 65 dB DNL_{mr} beneath the MOAs. Beneath the MTRs, noise levels would be 66 dB DNL_{mr} or less. Noise levels in SULMAs located under IR-301/307 and VR-1302 would be 66 dB DNL_{mr} (see Table BO 3.10–5).

Under Scenario B1, changes in supersonic noise would be less than 1 dB beneath the airspace units to be used for supersonic flights associated with the F-35A training mission. The change in the average number of sonic booms experienced per day under these airspace units would range from no change to an increase of 0.1 events per day.

BLM, USFWS, USFS, and the National Park Service are mandated to manage wilderness areas for their wilderness qualities, for example, maintaining the natural setting and allowing minimal human disturbance and development. Wilderness management goals could be negatively affected by increased noise and disturbance associated with military overflights. In some instances, provisions of a specific statute may apply, such as to the establishment of the Owyhee Wilderness Area in 2009, whereby military overflights and training are acknowledged as an existing and future activity in the vicinity. The quality of recreation experiences in wilderness areas, recreation areas, and other specially managed lands could also be affected, depending upon the type of recreation and remoteness of the area.

Scenario B2. Under Scenario B2, the projected F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from no change to an increase of 2 dB DNL_{mr} beneath the MOAs and a change ranging from an increase of 1 dB DNL_{mr} to an increase of 4 dB DNL_{mr} beneath the MTRs. The noise level would be at or below 66 dB DNL_{mr} beneath each of the MOAs and would range from 46 to 67 dB DNL_{mr} beneath the MTRs. Noise levels in SULMAs located under IR-301/307, R-3202, R-3204, and Jarbidge North

MOA would be 66 dB DNL_{mr}. Noise levels in SULMAs located beneath IR-302/305 would be 67 dB DNL_{mr}.

Under Scenario B2, the change in the supersonic noise level would range from no change to an increase of 1 dB CDNL under the airspace units to be used for supersonic flights. The average number of sonic booms experienced per day under Scenario B2 would range from no change to an increase of 0.2 events per day.

Scenario B3. Under Scenario B3, the projected F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from no change to an increase of 8 dB DNL_{mr} beneath the MOAs and a change ranging from an increase of 3 dB DNL_{mr} to an increase of 5 dB DNL_{mr} beneath the MTRs. The noise levels experienced beneath the MOAs would range from less than 45 to 67 dB DNL_{mr}. Beneath the centerlines of primary use MTRs, noise levels would also range from less than 45 to 67 dB DNL_{mr}. Noise levels of at least 65 dB DNL_{mr} or above are projected at SULMAs located under IR-301/307, IR-302/305, R-3202, R-3204, Jarbidge North MOA, and Owyhee North MOA.

Under Scenario B3, the supersonic noise level would range from no change to an increase of 1 dB CDNL under the airspace units to be used for supersonic flights. The average number of sonic booms experienced per day under Scenario B3 would range from no change to an increase of 0.4 events per day.

Auxiliary Airfield

Mountain Home AFB. The F-35A training beddown would not require construction or modification of facilities within Mountain Home AFB, the auxiliary airfield for proposed F-35A training exercises, under any of the scenarios.

<u>Scenario B1.</u> As summarized in Table BO 3.2–8, activities under Scenario B1 would increase the area surrounding Mountain Home AFB within the 65 dB DNL or greater noise contour by an estimated 634 acres compared with baseline conditions. The estimated number of additional persons affected by the projected increase in noise compared with baseline conditions would be one.

<u>Scenario B2.</u> Activities under Scenario B2 would increase the area surrounding Mountain Home AFB within the 65 dB DNL or greater noise contour by an estimated 1,276 acres compared with baseline conditions. The estimated number of additional persons affected by the projected increase in noise compared with baseline conditions would be one.

<u>Scenario B3.</u> Activities under Scenario B3 would increase the area surrounding Mountain Home AFB within the 65 dB DNL or greater noise contour by an estimated 1,943 acres compared with baseline conditions. The estimated number of additional persons affected by the projected increase in noise compared with baseline conditions would be two.

Recreation

Chapter 3, Section 3.8.2, describes typical impacts on recreation that can occur from noise and overflights associated with proposed military training. Changes affecting recreational uses in the training airspace for this proposal are described in more detail below.

Scenario B1. Table BO 3.10–8 lists special use areas with high recreational value or opportunity underlying military training airspace and the current and projected average noise level under each F-35A aircraft scenario. Changes in average noise levels underlying training airspace under Scenario B1 would range from about 1 to 4 dB DNL_{mr}. These changes would particularly affect quiet, remote areas; wilderness areas; and WSRs. Most of the SULMAs (see Land Use, above) underlying the airspace provide some kind of recreational use and would experience moderate changes in average noise levels. IR-301/307, which already has elevated noise levels, would increase from 64 to 66 dB DNL_{mr}. These levels are incompatible with residential and inhabited areas and would conflict with managing for pristine and wild qualities in several areas that provide exceptional recreational opportunities (including Big Hole National Battlefield, Clark Canyon Reservoir, Frank Church Wilderness, Hells Canyon National Recreation Area, Hells Canyon Wilderness Area). Rapid WSR, Salmon WSR, Selway WSR, Sawtooth National Recreation Area, and Selway-Bitterroot Wilderness Area. The Saddle A and B MOAs, which currently have low noise levels, would experience a moderate 4 dB increase to 49 dB DNL_{mr}. This would be noticeable but remain low with minor impacts of underlying recreational resources and experiences on Owyhee WSR and Owyhee Reservoir. Several WSAs also provide recreational opportunities throughout the affected region and are listed in Table BO 3.10–5.

Table BO 3.10–9 indicates the current and projected number of daily operations in each primary use airspace unit. In the MOAs, sortie-operations would increase by as much as 121 percent over baseline conditions. Because sortie-operations would be distributed over a wide area, noise from individual events may be audible to persons engaged in recreational activities underneath the MOA, but would usually be attenuated by distance. In the MTRs, the frequency of overflights is much lower at one or two per day, and the low altitude at which jets fly means that a smaller ground area is affected by the noise of each sortie-operation. While individual overflights could be loud and startling, overflight events would be relatively infrequent.

Increased noise could diminish opportunities for visitors to experience natural soundscapes in national park units, and could similarly diminish the qualities of natural quiet that are intrinsic to recreational opportunities in wilderness areas, WSAs, and other remote locations. The changes affecting important recreational areas are provided in Table BO 3.10–8 and BO 3.10–9. Craters of the Moon National Monument and Preserve (underlying IR-302/305) would experience an increase of 1 dB DNL_{mr} under Scenario 1 – a minimal increase that would generally be unnoticeable to most persons. Several wilderness areas and the Snake River Birds of Prey National Conservation Area and Bruneau Dunes State Park would also be affected. Avoidance of sensitive underlying locations (such as wilderness areas, national and state parks and monuments, and national and state recreation areas) could minimize the intensity of impacts.

Table BO 3.10–8. Average Noise Levels by Airspace and Associated Recreational Use Areas

Airspace	*Recreational Resource*[1]	*Noise Level (dB DNL$_{mr}$)* Baseline Conditions	*Scenario (No. of Aircraft)* B1 (24)	B2 (48)	B3 (72)
Jarbidge North MOA/ATCAA	Bruneau-Jarbidge Rivers Wilderness	64	65	66	67
Jarbidge South MOA/ATCAA	Jarbidge Wilderness Area	< 45	< 45	< 45	< 45
Owyhee North MOA/ATCAA	Big Jacks Creek Wilderness, North Fork Owyhee Wilderness, Pole Creek Wilderness, Owyhee River Wilderness	64	65	65	66
Owyhee South MOA/ATCAA	Owyhee River Wilderness	< 45	< 45	< 45	< 45
Paradise North MOA/ATCAA	Owyhee WSR, Owyhee River Wilderness	< 45	< 45	< 45	< 45
Paradise South MOA/ATCAA	N/A	< 45	< 45	< 45	< 45
Saddle A/B MOAs/ATCAAs	Owyhee WSR, Owyhee Reservoir	< 45	49	51	53
R-3202 (Saylor Creek Range	Snake River Birds of Prey NCA, Bruneau Dunes SP	64	65	66	67
R-3204A/B (Juniper Creek Range)	N/A	64	65	66	67
IR-301/307	Big Hole National Battlefield, Clark Canyon Reservoir and SRA, Deadwood Reservoir, Frank Church Wilderness, Hells Canyon NRA, Hells Canyon Wilderness Area, Rapid WSR, Salmon WSR, Selway WSR, Sawtooth NRA, Selway-Bitterroot Wilderness Area	64	66	66	67
IR-302/305	City of Rocks National Reserve, Craters of the Moon National Monument and Preserve, Craters of the Moon Wilderness, Jarbidge Wilderness Area, Minidoka NWR, Owyhee WSR, Sawtooth NRA and Wilderness Area	65	66	67	68
VR-316/319	Owyhee Reservoir, Owyhee WSR, Malheur NWR, Warm Springs Reservoir	53	55	57	58
VR-1302	Owyhee WSR, Owyhee River Wilderness	< 45	< 45	46	48

[1] Several WSAs underlie affected airspace and may support dispersed outdoor recreation. See Table BO 3.10–5.
Key: NRA=National Recreation Area; SRA=State Recreation Area.

Table BO 3.10–9. Daily Sortie-Operations by Airspace and Associated Recreational Use Areas

Airspace	*Recreational Resource*	***Daily Sortie-Operations*** Baseline Conditions	Scenario (No. of Aircraft) B1 (24)	B2 (48)	B3 (72)
Jarbidge North MOA/ATCAA	Bruneau-Jarbidge Rivers Wilderness	45	55	54	64
Jarbidge South MOA/ATCAA	Jarbidge Wilderness	10	11	11	12
Owyhee South MOA/ATCAA	Owyhee River Wilderness	10	11	11	12
Paradise North/South MOAs/ATCAAs	Owyhee WSR, Owyhee River Wilderness	10	11	11	12
Owyhee North MOA/ATCAA	Big Jacks Creek Wilderness, North Fork Owyhee Wilderness, Pole Creek Wilderness, Owyhee River Wilderness	40	48	50	58
Saddle A/B MOAs/ATCAAs	Owyhee WSR, Owyhee Reservoir	12	19	23	30
R-3202 (Saylor Creek Range)	Snake River Birds of Prey NCA, Bruneau Dunes SP	45	55	54	64
R-3204 A/B	N/A	45	55	54	64
IR-301/307	Big Hole National Battlefield, Clark Canyon Recreation Area, Frank Church Wilderness, Hells Canyon National Recreation Area, Hells Canyon Wilderness Area, Rapid WSR, Salmon WSR, Selway WSR, Sawtooth National Recreation Area, Selway-Bitterroot Wilderness Area	2	2	2	3
IR-302/305	City of Rocks National Reserve, Craters of the Moon National Monument and Preserve, Craters of the Moon Wilderness, Jarbidge Wilderness Area, Minidoka NWR, Owyhee WSR, Sawtooth National Recreation Area and Wilderness Area	1	2	2	3
VR-316/319	Owyhee Reservoir, Owyhee WSR, Malheur NWR, Warm Springs Reservoir	< 1	< 1	< 1	< 1
VR-1302	Owyhee WSR	< 1	< 1	< 1	< 1

Note: Several WSAs underlie affected airspace. See Table BO 3.10–5.

The F-35A training activities would slightly increase the frequency of sonic booms in the region. The overpressure caused by the F-35A at various altitudes is slightly less than the overpressure generated by F-15 aircraft, and is slightly less than the F-15, which is currently a frequent user of the airspace. Both these types of aircraft are currently performing supersonic events. The area beneath the Jarbidge North MOA and R-3202 and -3204 A/B currently averages 2.0 sonic boom per day, and this would increase to about 2.1 per day. The average number of sonic booms experienced per day beneath Owyhee North MOA would increase from 1.9 to 2.0. The number of booms in the Paradise MOA would remain at approximately 0.6 per day under all scenarios. Supersonic flight is not currently allowed in the Saddle A or B MOAs, and this would not change under the beddown of F-35A at Boise AGS. The change in frequency of sonic booms in the Jarbidge North and Owyhee North MOAs and their overlying ATCAAs would be imperceptible to most persons even though the individual booms may be highly noticeable. The startle effect from booms could create a hazard or cause annoyance to individuals engaged in recreation; however, the increase in frequency would be relatively low.

In general, a diverse range of active and passive recreational activities occurring throughout the region already coexists within a context of some exposure to military overflight. Increased average noise levels and increased numbers of operations would increase the probability that recreational participants would experience noise and startle effects from these activities. This could cause some degradation in enjoyment for those affected and loss of opportunity for quiet recreational environments in the region.

Scenario B2. Impacts under Scenario B2 would be similar to those described under Scenario B1. There would be a minor increase in noise effects compared with Scenario B1 for Jarbidge North, Owyhee North, and Saddle A/B MOAs at 66, 65, and 51 db DNL_{mr}, respectively. These represent noticeable increases of 2, 1, and 6 dB, respectively, over baseline conditions. The degree of change and higher levels may negatively affect the qualities expected by recreational users of sensitive underlying areas, including Owyhee WSR and Owyhee Reservoir (see Table BO 3.10–8); however, they are not likely to displace their use or change their relative importance considering that both recreation and military overflights are part of the existing context.

The number of operations under Scenario B2 is similar to Scenario B1; therefore, the probability of annoyance from noise-disturbing incidents during recreation is similar to Scenario B1. Similarly, the number of sonic booms would be slightly higher than under Scenario B1, with similar impacts on recreational resources, as described above.

Scenario B3. Implementation of this scenario would result in a further increase in noise levels and frequency in operations over projected Scenario B1 and B2 conditions. Increases in aircraft noise levels under Scenario B3 would further erode the opportunity for quiet, outdoor experiences in areas underlying Jarbidge North, Owyhee North, and Saddle MOAs/ATCAAs. Increased airspace use and increases of 2 to 3 dB DNL_{mr} over National Park Service units (Craters of the Moon National Monument and Preserve, Big Hole National Battlefield, City of Rocks National Reserve), Sawtooth National Recreational Area, Snake River Birds of Prey National Conservation Area and Bruneau Dunes State Park, seven Wilderness Areas, and one wild and scenic river (see Table BO 3.10–8) has the potential to impact visitor experience and the setting and feeling of the areas. Similar increases in noise in wilderness areas where noise is

already elevated (64 dB DNL_{mr} and above) would affect qualities of naturalness and potential for pristine outdoor experiences. In most areas, the increase in average noise beneath training airspace would likely be noticeable to persons familiar with the areas' attributes. It is difficult to predict what degree of change would cause persons to change their behavior and select alternative locations for activities that are more suited to quiet environments. Considering that military training would occur on weekends, this could be disruptive to specific recreational areas.

Under this scenario, the number of sortie-operations per average operational day would increase by up to 45 percent at Owyhee North MOA/ATCAA and by 150 percent at Saddle MOA. This would increase the likelihood that individuals would experience overflights in underlying areas, although most operations would occur above 10,000 feet AGL. At higher altitudes, while noise may still be relatively loud, the potential for startle effects would be low. Daily events on IR-301/307 and IR-302/305 could increase to about 3 per day. At low altitudes, these events are likely to be loud and noticeable for persons directly under these routes. Avoidance of sensitive underlying locations (such as wilderness areas, national and state parks and monuments, and national and state recreation areas) would minimize the intensity of impacts. Sonic booms beneath the Jarbidge and Owyhee North MOA/ATCAAs would have a more moderate increase in frequency, with one to three per day in any given location near the center of each airspace unit, compared to about one or two per day currently. This change is not likely to alter the context for recreation such that resources and specific locations would be avoided or would no longer be used as they are currently.

Auxiliary Airfield

Mountain Home AFB. F-35A operations at Mountain Home AFB would increase the total annual number of airfield operations at the installation from 23 to 71 percent over baseline conditions, with a related increase in noise levels at outdoor facilities on the base. There are no public or commercial recreational sites outside the base within the noise-impacted area (defined by noise levels of 65 dB DNL and above) under any scenario.

BO 3.11 Socioeconomics

BO 3.11.1 Base

The ROI for socioeconomics for the Boise AGS alternative is defined as Ada County, Idaho, and the city of Boise. Potential socioeconomic consequences from the F-35A training activities would be concentrated within the county and, more particularly, within the city. The definition of socioeconomic resources and methodology for analysis are described in Chapter 3, Section 3.9.

BO 3.11.1.1 Base Affected Environment

Population. In 2010, Ada County was ranked as the most populated county in the state of Idaho with a total of 392,365 persons, and accounted for approximately 25 percent of the total population of Idaho (see Table BO 3.11–1) (USCB 2010a). In 2010, Boise accounted for more than half of the county's population (52.4 percent). Boise AGS is home to the 124 FW of the Idaho ANG, the Army National Guard, and reserve units of the U.S. Army, Navy, and

Marine Corps. The 124 FW supports the 190th Fighter Squadron and consists of more than 1,400 full- and part-time airmen. Potential socioeconomic impacts would likely be focused within the city of Boise. Information is presented for the city of Boise and Ada County where recent data are available.

Table BO 3.11–1. Population Growth, 2000–2010

Location	*Census 2000*	*Census 2010*	*Average Annual Percentage Change 2000–2010*
Ada County	300,904	392,365	2.7
Boise	185,787	205,671	1.0
Idaho	1,293,953	1,567,582	1.9

Source: USCB 2010a.

Housing. As of 2010, there were an estimated 159,471 housing units in Ada County, 92,700 of which were in Boise. An estimated 85,704 housing units in Boise were occupied in 2010, resulting in an occupancy rate of over 92.5 percent (USCB 2010a). The percentage of owner-occupied residential units declined slightly throughout Ada County in the first two quarters of 2008 due to overall market conditions. Homeowners are having more difficulty selling their homes, and in some cases must either rent until they can find a buyer or lose their homes to foreclosure. As an Air National Guard Station, Boise AGS does not have on-base housing for the personnel assigned. All personnel assigned to Boise AGS rely on the private market for housing.

During scoping, several commenters expressed concern that the noise generated by the F-35A training at Boise AGS could adversely affect property values. In the state of Idaho, property values are determined based on the assessed market value of the property. The market value is calculated as the amount a buyer would be willing to pay for the property at a given moment in time. Two similar properties could have different market values based on factors such as proximity to schools and shopping; quality of neighboring properties; and neighborhood amenities, such as parks.

The recent recession and decline in housing values has had a severe impact on the real estate market and housing values, particularly in Boise and Ada County. The recession has resulted in falling sales prices. These lower sales prices would be reflected in the comparable sales evaluation of the market value of properties and would result in lower property values.

Schools. There are three school districts serving Ada County: the Independent School District of Boise City, the Meridian Joint School District, and the Kuna School District (Carr 2008). During the 2009–2010 school year, there were a total of 65,706 students in Ada County. The Meridian Joint School District was the largest in terms of enrollment, with 35,322 students, followed by the Independent School District of Boise City, with 25,521 students, and Kuna School District, with 4,863 students enrolled during the 2009–2010 school year (see Table BO 3.11–2). There are no schools located on Boise AGS.

Table BO 3.11–2. Number of Students, 2009–2010 School Year

Location	*Kindergarten–Grade 6*	*Grades 7–9*	*Grades 10–12*	*Total*
Independent School District of Boise City	13,742	5,810	5,969	25,521
Meridian Joint School District	19,873	8,231	7,218	35,322
Kuna School District	2,833	1,087	943	4,863
Ada County	36,448	15,128	14,130	65,706

Source: ISDBC 2010; ISDE 2010.

As of the 2008–2009 school year, the total fall membership for school districts in the state of Idaho was 275,075, and the number of classroom full-time-equivalent teachers was 15,143, for a student-to-teacher ratio of 18.17 (ISDE 2010). The State of Idaho has not stipulated maximum allowable class sizes.

Total Employment. Total employment in Ada County in 2008 was 282,057 jobs. Between 2006 and 2008, employment grew at an average annual rate of approximately 1.5 percent. The government and government enterprises industry has a total employment of 34,427 jobs; followed by retail trade, with 30,867 jobs; and health care and social assistance, with 29,946 jobs; (BEA 2010).

Public Services. Public services are provided by the county and city governments in the ROI, as well as other government agencies. Changes in population would affect the demand for these services, as well as the ability to fund them.

Tax revenues collected by the State of Idaho in FY2009 totaled over $3.1 billion, including a combination of property taxes, sales taxes, and income taxes (ISTC 2009). In the same fiscal year, Ada County collected over $79 million in tax revenues, and the City of Boise collected over $329 million in tax revenues (Ada County 2009; Boise 2009).

In Boise, the Boise Police Department is made up of approximately 407 employees (Boise 2010a). The annual budget for the Boise Police Department is $40.3 million. There are 216 firefighters at 15 fire stations in the Boise Fire Department (Boise 2010b).

The Ada County Medical Society comprises 690 medical personnel with varying specializations, including primary care, pediatrics, surgery, pharmacy, and nursing (ACMS 2010). The Ada County Medical Society is the second largest medical society in the state of Idaho (ACMS 2010).

BO 3.11.1.2 Base Environmental Consequences

Employment and Population. Potential socioeconomic impacts from construction expenditures and the change in personnel due to the F-35A beddown are summarized in Table BO 3.11–3. The direct jobs listed under construction would be new construction-related jobs. The indirect and induced jobs created by the construction expenditures would be spread among a variety of industries supporting construction, such as supplies and materials, food services, and retail services. The construction jobs under each scenario would constitute less than 1 percent of the total employment in Ada County and are not likely to generate migration into the county. Construction expenditures and the jobs created would be temporary and would result in 2–3 years of stimulation to the local construction industry.

The population increase under the F-35A aircraft scenarios would range from 1 to 2.6 percent. The incoming F-35A population is expected to move into the area as the F-35A aircraft arrive. The average annual population increase resulting from the F-35A personnel would range from 0.3 to 0.7 percent per year.

The unemployment rate in Ada County was 8.9 percent in 2010, with a total of 17,381 unemployed persons (BLS 2011). Therefore, the degree of induced employment growth is such that the positions could be filled by unemployed persons currently in the county or by spouses of the incoming personnel and is not likely to generate migration into the county. Under Scenario B3, the indirect and induced employment from the construction expenditures and personnel change have the potential to reduce the unemployment rate to as low as 7.3 percent, all other variables being equal.

Table BO 3.11–3. Potential Socioeconomic Impacts, Scenarios B1, B2, and B3

	Scenario B1 (24 Aircraft)	*Scenario B2 (48 Aircraft)*	*Scenario B3 (72 Aircraft)*
Construction (jobs)			
Direct	1,241	1,328	1,494
Indirect	464	497	559
Induced	483	517	582
Total	**2,188**	**2,342**	**2,635**
Population (persons)[1]			
Existing Conditions[3]	205,671	205,671	205,671
Direct	2,105	3,768	5,431
Total	**207,776**	**209,439**	**211,102**
Percentage Change	*1.0*	*1.8*	*2.6*
Employment (jobs)[2]			
Existing Conditions[4]	282,057	282,057	282,057
Direct	678	1,219	1,759
Induced	188	337	487
Total	**282,923**	**283,613**	**284,303**
Percentage Change	*0.3*	*0.6*	*0.8*
Housing (units)[1]			
Existing Conditions[3]	92,700	92,700	92,700
Direct	678	1,219	1,759
Total	**93,378**	**93,919**	**94,459**
Percentage Change	*0.7*	*1.3*	*1.9*
Students (persons)[1]			
Existing Conditions[5]	25,251	25,251	25,251
Direct	661	1,188	1,715
Total	**25,912**	**26,439**	**26,966**
Percentage Change	*2.6*	*4.7*	*6.8*
Student-Teacher Ratio	18.17	18.17	18.17
Number of Potential New Teachers	36	65	94
Tax Revenues (million dollars)			
State and Local Taxes	2.78	5.00	7.22

	Scenario B1 (24 Aircraft)	*Scenario B2 (48 Aircraft)*	*Scenario B3 (72 Aircraft)*
Federal Taxes	7.44	13.38	19.31
Total	**10.22**	**18.38**	**26.53**
Law Enforcement Officers (persons)[1]			
Existing Conditions[6]	407	407	407
Direct	4	7	11
Total	**411**	**414**	**418**
Percentage Change	*1.0*	*1.7*	*2.7*
Firefighters (persons)[1]			
Existing Conditions[7]	216	216	216
Direct	2	4	6
Total	**218**	**220**	**222**
Percentage Change	*1.0*	*1.8*	*2.6*
Medical Professionals (persons)[2]			
Existing Conditions[8]	690	690	690
Direct	7	13	18
Total	**697**	**703**	**708**
Percentage Change	*1.0*	*1.9*	*2.8*

[1] City of Boise ROI.
[2] Ada County ROI.
[3] Source: USCB 2010a.
[4] Source: BEA 2010.
[5] Source: ISDBC 2010.
[6] Source: Boise 2010a.
[7] Source: Boise 2010b.
[8] Source: ACMS 2010.

Housing. Assuming one household for each new member of Boise AGS personnel, the demand for housing would increase, as shown in Table BO 3.11–3. The housing market is not anticipated to be adversely affected by the increase in housing demand under any of the F-35A aircraft scenarios. New F-35A personnel, including the F-35A students, would be dependent on the community for housing. There were approximately 6,996 vacant housing units in Boise in 2010. The demand for up to 1,759 housing units, approximately 1.9 percent of the total number of housing units within the city, would not have an adverse impact on the housing market and could have a beneficial impact on a soft housing market affected by the collapse of the housing market bubble in 2007 (see Table BO 3.11–3).

Schools. The number of school-aged dependents between the ages of 4 and 18 was estimated and listed as students in Table BO 3.11–3. The average student-to-teacher ratio for the schools in the state of Idaho is 18.17 to 1. The addition of the students of F-35A personnel may result in the need for additional teachers, as listed in Table BO 3.11–3, depending on the resources available to the state and local governments. With the small number of students being added compared with the total enrollment of schools in the city of Boise, it is anticipated that the schools would have the capacity to accept the incoming students without impacting school resources.

Public Services. Provision of public services is dependent on the population needing the services and the ability of the state and local communities to provide those services, as supported by tax revenues. Using the Impact Analysis for Planning (IMPLAN) economic forecasting model, the amount of Federal, state, and local tax revenues generated by the increase in population and employment was estimated and is presented in Table BO 3.11–3.

The number of additional law enforcement officers, firefighters, and medical professionals has been estimated by determining the existing proportion of these services to the current population. The estimated population increase under each F-35A aircraft scenario would potentially support the addition of 4 to 11 law enforcement officers and 2 to 6 firefighters. The number of law enforcement officers and firefighters hired by the state and local authorities would be dependent on the level of tax revenues collected and the level of service provided by the existing police officers and firefighters. The number of medical professionals supporting Ada County and the city of Boise is estimated to increase by between 7 and 18 professionals under the scenarios. It is not anticipated that the population change would affect the provision of public services.

Noise. Airfield flight operations of the F-35A at Boise AGS are expected to increase the number of residents affected by noise levels greater than 65 dB DNL, compared with the baseline flight operations of Boise AGS and Boise Air Terminal Airport (see Table BO 3.11–4). Residents within the 65 dB DNL noise contour could be significantly affected by the increased noise. The impact of these noise levels as it relates to potential hearing loss is discussed in detail in Section BO 3.2.

Table BO 3.11–4. Estimated Residents Affected by Noise Levels Greater Than 65 dB DNL, Baseline Conditions and F-35A Beddown Scenarios

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario B1 (24 Aircraft)*	*Scenario B2 (48 Aircraft)*	*Scenario B3 (72 Aircraft)*
Total ≥ 65	**142**	**3,104**	**5,471**	**10,119**
65–69	131	2,157	3,894	7,521
70–74	11	590	955	1,755
75–79	–	289	457	530
80–84	–	68	143	258
≥ 85	–	–	22	55

Note: Without mitigations described in Section BO 3.2.1.2.
Source: USCB 2010a, as analyzed using GIS.

Property Values. The noise generated by the F-35A could have an adverse impact on property values for those properties that would be newly exposed to noise levels above 65 dB DNL and especially for properties newly exposed to noise levels above 75 dB DNL, which the EPA considers incompatible with residential use. This potential adverse impact on property values may be considered a significant impact on those residents newly affected by noise levels above 75 dB DNL (see Section 3.9.2).

Specific property values under noise contours would depend upon a variety of supply and demand variables. As described in Chapter 3, Section 3.9.2, a review of 33 studies of residential properties near airports resulted in the estimate that a specific residential property could be discounted between 0.5 and 0.6 percent per decibel when exposed to noise levels between 65 dB DNL and 75 dB DNL. Residential properties above 75 dB DNL would be expected to be discounted at a higher rate. Any discount in property values would be expected to be reflected in subsequent property tax assessments and associated property tax collections.

BO 3.11.2 Airspace

The ROI for socioeconomic resources under the airspace to be used by the F-35A includes the counties or the portions of the counties under the primary use airspace. Primary use airspace has been defined as airspace that would be used by the F-35A on a daily basis. Occasional use airspace would be used by the F-35A when the primary use airspace is unavailable. The occasional use airspace would be used infrequently; therefore, potential impacts on the areas underlying the occasional use airspace would be negligible. The definition of socioeconomic resources and methodology for analysis are described in Chapter 3, Section 3.9.

BO 3.11.2.1 Airspace Affected Environment

The F-35A would utilize the same airspace currently used by the A-10 mission at Boise AGS. The primary use airspace for the F-35A includes the existing Saddle A and B MOAs/ATCAAs, Owyhee North/South MOAs/ATCAAs, Paradise North/South MOAs/ATCAAs, and Jarbidge North/South MOAs/ATCAAs. The primary use airspace is associated with the MHRC, which includes the Saylor Creek Range (R-3202) and the Juniper Butte Range (R-3204). The airspace and range complex is located near the Idaho–Nevada–Oregon state borders with airspace in all three states.

Seven MTRs would be used by the F-35A as primary use airspace, as shown in Table BO 2.2–2; however, these airspace units represent only narrow corridors of airspace, which overlie only small portions of remote counties. No socioeconomic impacts are expected from the F-35A using these MTRs.

Because no new airspace or airspace modifications are proposed for the F-35A beddown, no additional population would be affected by training overflights. The area under the airspace is not densely populated. GIS and 2010 census data were used to estimate the population under the primary use airspace (see Table BO 3.11–5). No population centers are located below R-3202 or R-3204; therefore, they are not listed in the table below.

Table BO 3.11–5. Population Under the Proposed F-35A Primary Use Airspace at Boise AGS

Airspace Units	*Counties Overflown*	*Total Affected Population (2010)*	*Total Population of Counties Overflown (2010)*	*Percentage of Total County Population*
Saddle A and B MOAs/ATCAAs	Malheur County, Oregon	1,353	31,313	3.5
	Harney County, Oregon		7,422	
Owyhee North/South MOAs/ATCAAs	Owyhee County, Idaho	2,180	11,526	3.6
	Elko County, Nevada		48,818	
Paradise North/South MOAs	Elko County, Nevada	2,052	48,818	1.9
	Humboldt County, Nevada		16,528	
	Malheur County, Oregon		31,313	
	Owyhee County, Idaho		11,526	
Jarbidge North/South MOAs/ATCAAs	Elmore County, Idaho	1,715	27,038	1.6
	Owyhee County, Idaho		11,526	
	Twin Falls County, Idaho		20,978	
	Elko County, Nevada		48,818	

Source: USCB 2010a, as analyzed using GIS.

In addition to use of airspace and the MHRC, the F-35A aircraft at Boise AGS would use Mountain Home AFB as an auxiliary airfield for certain training events. No construction or personnel changes at Mountain Home AFB are proposed as part of this training. F-35A aircraft would simply use the airfield assets of Mountain Home AFB by performing practice approaches to the runway. Therefore, socioeconomic analysis focuses on the potential impacts on population and housing as a result of noise generated by the F-35A training events at Mountain Home AFB.

Mountain Home AFB is located in Elmore County, Idaho, approximately 12 miles from the city of Mountain Home. The base is somewhat isolated from the primary residential areas in the county. The 2010 population of Elmore County was 27,038, a decrease from the 2000 population of 29,130 (USCB 2000a, 2010a). In 2010, there were 12,162 housing units in Elmore County, an increase of approximately 1,635 housing units since 2000. The nearest residential area is the on-base housing at Mountain Home AFB. There are 1,135 housing units and 680 dorm units. Current flight operations at Mountain Home AFB generate noise levels that affect an estimated 10 off-installation residents at levels greater than 65 dB DNL (see Table BO 3.11–6).

Table BO 3.11–6. Residents Affected by Noise Levels Greater Than 65 dB DNL, Mountain Home AFB

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario B1 (24 Aircraft)*	*Scenario B2 (48 Aircraft)*	*Scenario B3 (72 Aircraft)*
Total ≥ 65	**10**	**11**	**12**	**12**
65–69	4	4	5	5
70–74	1	1	1	1
75–79	5	6	6	6
80–84	–	–	–	–
≥ 85	–	–	–	–

Source: USCB 2010a, as analyzed using GIS.

BO 3.11.2.2 Airspace Environmental Consequences

F-35A aircraft using the airspace units listed in Table BO 3.11–5 would be governed by the same regulations and guidelines as the aircraft currently using the airspace. Supersonic operations would only take place above the minimum altitudes designated for each airspace unit. Flight safety guidelines are discussed in Section BO 3.4. The population under the primary use airspace units is currently exposed to military aircraft overflights and supersonic operations. The population density under each airspace unit is low, at less than 1 person per square mile for each airspace unit, compared with the average population density of 15.6 persons per square mile for Idaho, 35.6 persons per square mile for Oregon, and 18.2 persons per square mile for Nevada.

Noise levels in the airspace are discussed in more detail in Section BO 3.2. Table BO 3.2–5 presents the primary use airspace units under each aircraft scenario and the resulting change in noise levels from projected F-35A flight operations. The noise levels generated in the training airspace under all of the scenarios would not exceed 65 dB DNL, with the exception of the Jarbidge North MOA/ATCAA and the Restricted Areas under Scenarios B2 and B3, Owyhee North MOA/ATCAA under Scenario B3, and IR-301/307 and IR-302/305 under all F-35A scenarios. The noise generated by military aircraft in primary use airspace is expected to cause annoyance in affected persons; however, the change in noise levels is not expected to adversely affect economic decisions, property values, or other socioeconomic resources in the areas underlying the airspace.

Table BO 3.11–6 presents the estimated number of residents in the vicinity of Mountain Home AFB that would be exposed to noise levels greater than 65 dB DNL under baseline conditions and F-35A aircraft scenarios. The number of off-base residents that would be affected by F-35A training operations is about the same as the number of off-base residents affected by current airfield operations. Elmore County zoning provides for a 2-mile noise and safety buffer around Mountain Home AFB to reduce the potential for growth. This zoning limits development on properties and reduces the potential for residents to be exposed to noise levels of 65 dB DNL. This zoning limits growth for properties exposed to noise levels above 75 dB DNL, which the EPA considers incompatible with residential use. For each F-35A aircraft scenario, only one additional resident would be affected by noise levels greater than 75 dB DNL that could have a potential adverse impact on property values.

BO 3.12 Environmental Justice and Protection of Children

BO 3.12.1 Base

The ROI for environmental justice and protection of children is defined as the region in which there is the potential for adverse impacts from construction or flight operations. This region includes the area potentially affected by high noise levels. In accordance with the *Guide for Environmental Justice Analysis with the Environmental Impact Process*, the ROI is compared with the community of comparison, which is defined as Ada County (Air Force 1997b). The definition of environmental justice and methodology for analysis are described in Chapter 3, Section 3.10.

BO 3.12.1.1 Base Affected Environment

The analysis of environmental justice for the base and vicinity considers changes in airfield noise levels caused by the F-35A beddown scenarios. The existing area affected by noise levels from Boise AGS and the Boise Air Terminal Airport is depicted in Figures BO 3.2–1 through BO 3.2–3. Using 2010 census data, the number of persons affected by off-base noise from Boise AGS and Boise Air Terminal Airport was estimated. Under baseline conditions, an estimated 142 persons are affected by noise levels greater than 65 dB DNL (see Section BO 3.12.1.2, Table BO 3.12–2). Of these persons affected, approximately 14.8 percent are minorities and 18.2 percent are low-income (see Section BO 3.12.1.2, Table BO 3.12–2). Baseline noise levels over 75 dB DNL do not extend beyond the airport property.

Table BO 3.12–1 identifies total population and percentage populations of concern in Ada County, which serves as the community of comparison required for environmental justice analysis, as well as in the state of Idaho and the United States.

Minority persons represent 13.5 percent of the total population in Ada County and 16.0 percent of the state population. The minority population at the national level is 36.3 percent. Persons categorized as Hispanic or Latino were the predominant minority group, with 4.5 percent of the total population in Ada County and 7.9 percent at the state level.

Table BO 3.12–1. Total Population and Populations of Concern, 2010

Location	*Total Population*	*Percentage Minority*	*Percentage Low-Income*	*Percentage Youth*
Ada County	392,365	13.5	9.4	26.4
Idaho	1,567,582	16.0	13.5	27.4
United States	308,745,538	36.3	13.5	24.0

Source: USCB 2010a, 2010b.

The percentage of persons and families in Ada County with incomes below the poverty level was somewhat lower than state levels, averaging 7.1 percent in the county, compared with 11.2 percent in Idaho as a whole, and 16.3 percent at the national level.

The youth population, comprising children under the age of 18 years, constitutes 26.4 percent of the Ada County population, compared with 27.4 percent for Idaho overall, and 24.0 percent for the Nation. No schools or child care centers are currently affected by noise levels greater than 65 dB DNL from Boise AGS baseline operations.

BO 3.12.1.2 Base Environmental Consequences

No disproportionately high and adverse human health or environmental effects on minority or low-income populations have been identified as a result of construction activities on Boise AGS. Construction would occur within the Boise AGS cantonment area and would not affect off-base populations.

Residents within the 65 dB DNL noise contour could be significantly affected by the increased noise. Table BO 3.12–2 lists the estimated population affected by noise levels greater than 65 dB DNL under each aircraft scenario, as well as the estimated share of minority and low-income populations affected. The estimated number of individual schools and child care centers affected by noise levels greater than 65 dB DNL are listed in Table BO 3.12–3.

Table BO 3.12–2. Populations of Concern Affected by Noise Levels Greater Than 65 dB DNL

	Total Affected Population (2010)	*Number (Percentage) Minority*		*Number (Percentage) Low-Income*	
Baseline Conditions	142	24	(16.9)	26	(18.3)
Scenario B1 (24 Aircraft)	3,105	536	(17.3)	508	(16.4)
Scenario B2 (48 Aircraft)	5,472	871	(15.9)	826	(15.1)
Scenario B3 (72 Aircraft)	10,119	1,673	(16.5)	1,464	(14.5)

Note: Numbers proportionately reduced with mitigations described in Section BO 3.2.1.2.
Source: USCB 2010a, 2010b, as analyzed using GIS.

Table BO 3.12–3. Number of Schools and Child Care Centers Affected by Noise Levels Greater Than 65 dB DNL

Noise Levels (dB DNL)	*Baseline Conditions*		*Scenario B1 (24 Aircraft)*		*Scenario B2 (48 Aircraft)*		*Scenario B3 (72 Aircraft)*	
	Schools	**Child Care Centers**	**Schools**	**Child Care Centers**	**Schools**	**Child Care Centers**	**Schools**	**Child Care Centers**
Total ≥ 65	**–**	**–**	**1**	**3**	**1**	**6**	**2**	**13**
65–69	–	–	1	3	1	5	1	11
70–74	–	–	–	–	–	–	1	1
75–79	–	–	–	–	–	1	–	1
80–84	–	–	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–	–	–

As described in Section BO 3.12.1.1, in Ada County, which is defined as the community of comparison, the minority population constitutes 13.5 percent of the total population, and the low-income population constitutes 9.4 percent. The share of the minority population affected by noise levels greater than 65 dB DNL is comparable to the share of the minority population in the community of comparison. While the share of the adversely affected low-income populations listed in Table BO 3.12–2 is greater than the community of comparison, the difference is not considered substantial enough to be disproportionate. Therefore, noise impacts would not present a disproportionately high and adverse human health or environmental effect on minority or low-income populations.

Schools and child care centers are considered compatible with noise levels up to 75 dB DNL with additional noise attenuation. For noise levels above 75 dB DNL, educational services are not compatible regardless of noise attenuation. Additionally, these noise levels are not compatible with outdoor use and could contribute to hearing loss in children regularly exposed to aircraft noise.

Table BO 3.12–3 presents the estimated number of schools and child care centers affected by noise levels greater than 65 dB DNL. The noise levels generated under the F-35A aircraft scenarios in regard to schools and child care centers would have potential adverse impacts on

children at these locations and may be considered significant. Additional detail concerning noise and the potential for interference with learning in terms of the ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI 2009) is provided in Section BO 3.2, Noise.

BO 3.12.2 Airspace

The ROI for environmental justice and protection of children under the airspace to be used by the F-35A includes the counties or the portions of the counties under the primary use airspace. Primary use airspace has been defined as airspace that would be used by the F-35A on a daily basis. Occasional use airspace would be used by the F-35A when the primary use airspace is unavailable. The occasional use airspace would be used infrequently; therefore, potential impacts on the areas underlying the occasional use airspace would be negligible. The definition of environmental justice and methodology for analysis are described in Chapter 3, Section 3.10.

BO 3.12.2.1 Airspace Affected Environment

The number of minority and low-income individuals and persons under the age of 18 under the primary use airspace was estimated using GIS analysis of 2010 census data. This information is provided in Table BO 3.12–4. No population centers are located under the restricted airspace. Therefore, R-3202 and R-3204 are not listed in Table BO 3.12-4. The largest concentration of minority populations under the airspace occurs under the Jarbidge North/South MOAs. The Duck Valley Reservation of the Shoshone-Paiute Tribes and the town of Owyhee are located under the Owyhee North/South MOAs.

Table BO 3.12–4. Populations of Concern Under the Primary Use Airspace

Airspace Units	*Counties Overflown*	*Total Affected Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
Saddle A and B MOAs/ATCAAs	Malheur County, Oregon	1,353	311	23.0	240	17.7	165	12.2
	Harney County, Oregon							
Owyhee North/South MOAs/ATCAAs	Owyhee County, Idaho	2,180	922	42.3	381	17.5	586	26.9
	Elko County, Nevada							
Paradise North/South MOAs/ATCAAs	Elko County, Nevada	2,052	576	28.1	287	14.0	404	19.7
	Humboldt County, Nevada							
	Malheur County, Oregon							
	Owyhee County, Idaho							
Jarbidge North/South MOAs/ATCAAs	Elmore County, Idaho	1,715	639	37.2	265	15.5	458	26.7
	Owyhee County, Idaho							
	Twin Falls County, Idaho							
	Elko County, Nevada							

Airspace Units	*Counties Overflown*	*Total Affected Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
IR-301/IR-307	Adams County, Idaho Boise County, Idaho Custer County, Idaho Idaho County, Idaho Lemhi County, Idaho Valley County, Idaho Washington County, Idaho Beaverhead County, Montana Ravalli County, Montana	8,625	495	5.7	1,286	14.9	1,700	19.7
IR-302/IR-305	Blaine County, Idaho Camas County, Idaho Cassia County, Idaho Elmore County, Idaho Minidoka County, Idaho Power County, Idaho Elko County, Nevada Humboldt County, Nevada Malheur County, Oregon Box Elder County, Utah	11,051	2,869	26.0	1,362	12.3	2,974	26.9
VR-1302	Baker County, Oregon Harney County, Oregon Malheur County, Oregon	1,401	295	21.1	179	12.8	192	13.7
VR-316/VR-319	Crook County, Oregon Deschutes County, Oregon Grant County, Oregon Harney County, Oregon Lake County, Oregon Malheur County, Oregon	6,945	859	12.4	1,049	15.1	1,340	19.3

Source: USCB 2010a and 2010b, as analyzed using GIS.

As part of the environmental justice analysis, the minority, low-income, and youth populations are presented for the communities of comparison, which are represented by the counties and states in which the airspace is located. This information is presented in Table BO 3.12–5.

Table BO 3.12–5. Communities of Comparison Under the Primary Use Airspace

Community of Comparison	Total Population (2010)	Minority	Percentage Minority	Low-Income	Percentage Low-Income	Youth	Percentage Youth
Adams County, Idaho	3,976	208	5.2	459	11.6	763	19.2
Blaine County, Idaho	21,376	4,707	22.0	2,272	10.6	5,203	24.3
Boise County, Idaho	7,028	476	6.8	894	12.7	1,509	21.5
Butte County, Idaho	2,891	178	6.2	462	16.0	815	28.2
Camas County, Idaho	1,117	109	9.8	177	15.9	240	21.5
Cassia County, Idaho	22,952	6,210	27.1	3,768	16.4	7,587	33.1
Custer County, Idaho	4,368	260	6.0	520	11.9	858	19.6
Elmore County, Idaho	27,038	6,733	24.9	3,081	11.4	7,675	28.4
Idaho County, Idaho	16,267	1,239	7.6	3,024	18.6	3,405	20.9
Lemhi County, Idaho	7,936	393	5.0	1,268	16.0	1,576	19.9
Minidoka County, Idaho	20,069	6,974	34.8	2,696	13.4	5,893	29.4
Owyhee County, Idaho	11,526	3,659	31.7	2,360	20.5	3,369	29.2
Power County, Idaho	7,817	2,653	33.9	1,214	15.5	2,414	30.9
Twin Falls County, Idaho	77,230	13,389	17.3	10,904	14.1	21,144	27.4
Valley County, Idaho	9,862	585	5.9	1,593	16.2	1,949	19.8
Washington County, Idaho	10,198	2,032	19.9	1,494	14.6	2,518	24.7
Idaho	1,567,582	251,339	16.0	210,921	13.5	429,072	27.4
Beaverhead County, Montana	9,246	679	7.3	1,306	14.1	1,860	20.1
Ravalli County, Montana	40,212	2,448	6.1	5,886	14.6	8,824	21.9
Montana	989,415	120,787	12.2	145,419	14.7	223,563	22.6
Elko County, Nevada	48,818	15,088	30.9	4,160	8.5	14,230	29.1
Humboldt County, Nevada	16,528	5,133	31.1	2,228	13.5	4,524	27.4
Nevada	2,700,551	1,238,470	45.9	299,749	11.1	665,008	24.6
Baker County, Oregon	16,134	1,190	7.4	3,133	19.4	3,280	20.3
Crook County, Oregon	20,978	2,220	10.6	2,852	13.6	4,600	21.9
Deschutes County, Oregon	157,733	18,263	11.6	14,007	8.9	36,221	23.0
Grant County, Oregon	7,445	494	6.6	1,074	14.4	1,430	19.2
Harney County, Oregon	7,422	774	10.4	1,110	15.0	1,664	22.4
Lake County, Oregon	7,895	1,020	12.9	1,395	17.7	1,525	19.3
Malheur County, Oregon	31,313	11,407	36.4	5,394	17.2	8,004	25.6
Oregon	3,831,074	825,226	21.5	521,125	13.6	866,453	22.6
Box Elder County, Utah	49,975	5,866	11.7	4,230	8.5	16,978	34.0
Utah	2,763,885	542,166	19.6	287,972	10.4	871,027	31.5

Source: USCB 2010a and 2010b.

In addition to the populations of concern under the airspace, the populations of concern were evaluated in the vicinity of the auxiliary airfield, Mountain Home AFB. The focus of the environmental justice analysis for the auxiliary airfields is the area potentially adversely affected by noise contours. Figures BO 3.2–5 through BO 3.2–7 present the noise contours for Mountain Home AFB.

Elmore County, Idaho, is the community of comparison for Mountain Home AFB. Information on the populations of concern in Elmore County is presented in Table BO 3.12–5. Under baseline conditions, noise levels above 65 dB DNL affect an estimated 10 persons, 10.0 percent of which are minorities and 10.0 percent are low-income. The only school in the vicinity of Mountain Home AFB is the on-base primary school. The on-base child care center is also the only child care center in the vicinity of Mountain Home AFB.

BO 3.12.2.2 Airspace Environmental Consequences

The noise levels generated in the training airspace under all of the scenarios would not exceed 65 dB DNL_{mr}, with the exception of the Jarbidge North MOA/ATCAA, which would reach noise levels of 66 dB DNL_{mr} and 67 dB DNL_{mr} under Scenarios B2 and B3, respectively; the Owyhee North MOA/ATCAA, which would experience noise levels of 66 dB DNL_{mr} under Scenario B3; IR-301/307, which would experience noise levels as high as 67 dB DNL_{mr} under Scenario B3; and IR-302/305, which would experience noise levels as high as 68 dB DNL_{mr} under Scenario B3. For the Owyhee North MOA/ATCAA, IR-302/305, and IR-301/307, the affected minority and low-income populations under these airspace units are comparable to the communities of comparison and do not represent a disproportionate impact. For Jarbidge North MOA/ATCAA, the total share of affected minority and low-income populations under the airspace boundaries is greater than the share of minority and low-income populations in some of the counties overflown. Therefore, there is the potential for disproportionately high and adverse impacts on minority and low-income populations.

In 1996, the Air Force negotiated a Settlement Agreement with the Shoshone-Paiute Tribes, which stipulates that aircraft overflights are not permitted over the Duck Valley Reservation below 15,000 feet AGL and are not permitted at any altitude within a 5-mile radius of the town of Owyhee (Air Force 2009a). The Settlement Agreement also stipulates that flare use is not authorized over the reservation at any altitude. The Settlement Agreement is implemented and enforced by Mountain Home AFB. F-35A pilots stationed at Boise AGS using the Jarbidge North/South and Owyhee North/South MOAs would be required to follow all current flight restrictions in the airspace.

As the auxiliary airfield for Boise AGS F-35A aircraft, Mountain Home AFB would experience an increase in noise levels. Table BO 3.12–6 lists the number and percentage of minority and low-income populations affected by noise levels greater than 65 dB DNL under each F-35A aircraft scenario.

Table BO 3.12–6. Estimated Populations of Concern Affected by Noise Levels Greater Than 65 dB DNL at Mountain Home AFB

	Total Affected Population (2010)	*Number (Percentage) Minority*	*Number (Percentage) Low-Income*	*Number of Schools*	*Number of Child Care Centers*
Baseline Conditions	10	1 (10.0)	1 (10.0)	1	1
Scenario B1 (24 Aircraft)	11	1 (9.1)	1 (9.1)	1	1
Scenario B2 (48 Aircraft)	11	1 (9.1)	1 (9.1)	1	1
Scenario B3 (72 Aircraft)	12	1 (8.3)	1 (8.3)	1	1

Source: USCB 2010a and 2010b, as analyzed using GIS.

As described in Section BO 3.12.2.1, Elmore County is the community of comparison for Mountain Home AFB. Minority persons in Elmore County constitute 24.9 percent of the population; low-income persons constitute 11.4 percent. The share of the affected minority and low-income population is substantially less than or comparable to that of the community of comparison. Therefore, noise impacts would not result in a disproportionately high and adverse human health or environmental effect on minority or low-income populations.

The school and child care center located on Mountain Home AFB would be affected by noise levels greater than 65 dB DNL under baseline conditions. Under the F-35A aircraft scenarios, noise levels would continue to be above 65 dB DNL. Therefore, the noise levels generated under the F-35A aircraft scenarios in regard to schools would have potential adverse impacts on children at these locations. Additional detail concerning noise and the potential for interference with learning in terms of the ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI 2009) is provided in Section BO 3.2, Noise.

BO 3.13 Infrastructure

BO 3.13.1 Base

BO 3.13.1.1 Base Affected Environment

Potable Water System. United Water Idaho owns, operates, and maintains the water distribution system to 81,000 customers in Boise, including the individual facility meters for Boise AGS. Potable water facilities include 83 wells, two surface-water treatment plants, and 37 reservoirs. United Water Idaho's delivery capacity is 100.5 million gallons per day (MGD), which easily accommodates Boise AGS's average consumption of 0.2 MGD. Potable water consumption for calendar year (CY) 2009 at Boise AGS was 14.6 million gallons.

As part of the nearby system, United Water Idaho operates two 150,000-gallon water storage tanks to service the base during the peak summer demand period. These tanks supply additional water for fire protection and improvement of low-pressure problems. Water quality in the area is good and meets clean-water standards.

On-base water uses consist of irrigation, aircraft and tank washing, fire fighting, and minimal domestic use. Groundwater resources and wells providing water to Boise AGS are unaffected by base operations. The base experiences no water-availability problems during any season.

Sanitary Sewer System. The City of Boise Department of Public Works owns, operates, and maintains the sewer system, including main lines, service lines, and treatment facilities. The city operates two wastewater treatment plants: the Lander Street Wastewater Treatment Plant (processing 15 MGD) and the West Boise Wastewater Treatment Plant (currently processing 15–16 MGD and expanding to 30 MGD). Industrial discharges (e.g., floor drains, wash rack wastewater, and tanker pads) in the vicinity of Building 1502 are collected and passed through an oil–water separator (OWS), a sediment trap, a sand and grease trap, or a combination of these treatments. The filtered wastewater is combined with storm water runoff and directed toward one of three drainage fields. One drainage field maintains the tanker pad (northwest of tanker pad), one maintains the Building 1502 parking lot (south of Building 1502), and one maintains wastewater generated inside Building 1502 (southeast of Building 1502).

Storm Water Drainage System. Storm water on the Boise AGS facilities is regulated under the NPDES Multi-Sector General Permit (Permit No. DR05A58F). The NPDES permit considers industrial activities associated with airfield operations to be covered under the industrial permit. The permit recognizes the potential for runoff contamination, authorizes the discharge of storm water associated with specific industrial activities, and requires monitoring activities. The EPA requires the development and implementation of an SWPPP as a requirement for compliance with NPDES storm water permits. The SWPPP is an engineering and management strategy prepared specifically for the 124 FW to improve the quality of the storm water runoff and thereby improve the quality of the receiving waters. The SWPPP is amended whenever there is a change in facility design, construction, operation, or maintenance that materially affects the potential for storm water contamination at the facility. Any amendments are implemented to the maximum extent practicable after such a change occurs.

Some industrial discharges (e.g., wash rack wastewater and floor drains) are collected and passed through an OWS, a sediment trap, a sand and grease trap, or a combination of these treatments. The filtered wastewater is combined with rainwater, storm water runoff, and snowmelt and directed to the storm water drainage system. This water is discharged into the drainage ditch that runs laterally through the center of Boise AGS toward Boise Air Terminal Airport.

Solid Waste Management. Boise AGS uses a State of Idaho contractor for nonhazardous solid waste disposal. Dumpsters are located throughout the base for collection of office waste and inert industrial solid waste. The contractor disposed of 1,589 cubic yards in CY2009 at the Hidden Hollow Landfill run by the Ada County Solid Waste Management Department (Hawkes 2010). The 40-acre Hidden Hollow Landfill has 4 more years of capacity (i.e., 2.1 million cubic yards) at the current disposal rate of 425,000 tons per year. However, the Ada County Solid Waste Management Department is completing construction on the nearby 22-acre North Ravine Cell. This landfill and other planned landfill cells should provide sufficient disposal capacity for another 100 years (Hutchinson 2007). The disposal rate for construction/demolition debris is $11 per cubic yard and that for asbestos-containing material (ACM) is $40 per cubic yard (Ada County 2008).

Electrical System. All electricity is provided to Boise AGS by the commercial utility, Idaho Power. Idaho Power owns, operates, and maintains all the utility poles, overhead lines, ground transformers, underground power cables, and meters. Electricity consumption for CY2009 at Boise AGS was 5,610,546 kilowatt-hours.

Natural Gas System. Natural gas is currently provided to Boise AGS by Intermountain Gas Company. Natural gas consumption for CY2009 at Boise AGS was 154,972 CCF (hundreds of cubic feet).

BO 3.13.1.2 Base Environmental Consequences

Potable Water System. Potable water is supplied to residents of Boise and the Boise AGS installation from United Water Idaho. The potable water demand would increase, primarily within the city, with the increased population associated with the proposed personnel changes based on the three aircraft scenarios. Average demand (in 2010) for potable water in Boise is about 38.3 MGD. With an average per capita household water use estimation of about 70 gallons per day (AWWA 2010), it is anticipated that additional personnel associated with Scenario B3 would result in an increase of approximately 380,170 gallons per day (see Table BO 3.13–1). This represents a potential increase of less than 1 percent of the current demand. The existing potable water distribution system can support the additional demand.

Table BO 3.13–1. Percentage of Potential Increases in Potable Water/Wastewater

Aircraft Scenario	*Net Personnel Change (Including Dependents)*	*Volume of Water (Potable Water and Wastewater) Per Day (gallons)*	*Percentage of Potable Water Use Increase Over Baseline Conditions*	*Percentage of Wastewater Generation Increase Over Baseline Conditions*	
				Lander Street Plant	**West Boise Plant**
Scenario B1 (24 Aircraft)	+2,105	147,350	+ < 1	+ 1	+ < 1
Scenario B2 (48 Aircraft)	+3,768	263,760	+ < 1	+ 2	+ 1
Scenario B3 (72 Aircraft)	+5,431	380,170	+ < 1	+ 2.8	+1.5

Sanitary Sewer System. The EPA estimates that the average person generates approximately 70 gallons of wastewater per day between showering, toilet use, and general water use (EPA 2005). Utilizing a 70-gallon-per-day generation rate, it was estimated that the additional personnel associated with the largest potential increase in personnel (under Scenario B3) would produce approximately 380,170 gallons of wastewater per day. While it is unknown where in the community new personnel and their dependents would live if the resulting wastewater generated were processed at a single plant, wastewater generation would increase approximately 2.8 percent for the Lander Street Plant and 1.5 percent for the West Boise Plant. However, it is likely that wastewater would be distributed between the two plants based on where personnel choose to live, thereby decreasing the plant-specific wastewater estimations. As a result, these increases would be less than significant, and the Air Force does not expect either treatment facility to be adversely affected.

Storm Water Drainage System. A high percentage of the active administrative and industrial areas of the installation are paved or roofed and exhibit high runoff coefficients. Drainage of the built-upon area is by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. All storm water drainage systems on the installation discharge into Five Mile Creek, which runs along the southern boundary of the installation.

Storm water on the Boise AGS facilities is regulated under the NPDES Multi-Sector General Permit (Permit No. DR05A58F). Some industrial discharges (i.e., wash rack wastewater and floor drains) are collected and passed through an OWS, a sediment trap, a sand and grease trap, or a combination of these treatments. The filtered wastewater is combined with rainwater, storm water runoff, and snowmelt and directed to the storm water drainage system. This water is discharged into the drainage ditch that runs laterally through the center of Boise AGS and discharges to Five Mile Creek.

Boise AGS has implemented an SWPPP to deal with any impacts that may occur as a result of the F-35A aircraft scenarios. The F-35A aircraft scenarios would not impact the storm water drainage system.

Solid Waste Management. Boise AGS does not operate an onsite solid waste facility (landfill). All solid waste is collected and transported off site for disposal. Off-base contractors completing any demolition and construction projects at the Boise AGS installation would be responsible for disposing of waste generated by these activities. Contractors would be required to comply with Federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled, reused, or otherwise diverted from landfills. All non-recyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste, including waste contaminated with hazardous waste, ACM, lead-based paint (LBP), or other undesirable components, would be managed in accordance with AFI 32-7042, *Waste Management* (Air Force 2009b). Thus, only minor impacts on the solid waste management system at the Boise AGS installation are anticipated due to the proposed demolition and construction. Solid waste would be transported off site during the operational phase of the F-35A aircraft scenarios.

Electrical System. The demand for energy (primarily electricity) would increase during the demolition, construction, or operational phases under all of the F-35A aircraft scenarios. The Air Force has estimated that electrical use for 188,420 square feet of new or modified operations, training, and maintenance facilities would be 3,561,140 kilowatt-hours annually. To estimate the electrical use associated with personnel and their dependents, data from the U.S. Energy Information Administration (USEIA 2010) were used to identify that consumers averaged about 13,000 kilowatt-hours per person (654,545 users) in Idaho in 2008 (the best available statistics), with a total of about 8,509,085,000 kilowatt-hours consumed. At a maximum potential increase of 5,431 additional people under Scenario B3, a potential increase of about 70,603,000 kilowatt-hours of electricity can be anticipated. This represents less than 1 percent of total usage in 2008. Even under an optimal usage scenario, this increase is very small and not significant; scenarios of less than 72 aircraft are expected to result in fewer impacts. In addition, the Air Force expects increases in electrical use associated with new facilities to be reduced as LEED [Leadership in Energy and Environmental Design] requirements for energy efficiency are

implemented. Idaho Power provides Boise AGS with its electrical power needs. The electrical energy supply grid at the Boise AGS installation is adequate and would not be affected.

Natural Gas System. It is not anticipated that natural gas consumption would increase during the demolition and construction phases of the F-35A aircraft scenarios. As additional heated working and administrative spaces are developed and operations increase under the F-35A aircraft scenarios, the Air Force estimates that natural gas consumption could increase by 6,726,600 cubic feet. For residential consumption estimations, according to the U.S. Energy Information Administration (USEIA 2010), approximately 336,200 residential consumers in Idaho used about 25,210 million cubic feet of natural gas in 2009. This equates to an average of about 0.075 million cubic feet per person per year. Under Scenario B3, the largest potential increase in people would be 5,431. Assuming all persons use natural gas, which is unlikely, the greatest potential increase in consumption would be about 407 million cubic feet annually. This equates to an increase of approximately 1.6 percent in natural gas usage, with this number likely being much less. Even under an optimal usage scenario, this increase is very small and not significant; scenarios of less than 72 aircraft are expected to result in fewer impacts. The natural gas energy supply from Intermountain Gas Company at the Boise AGS installation is adequate and would not be affected.

BO 3.14 Transportation

BO 3.14.1 Base

BO 3.14.1.1 Base Affected Environment

Regional Access. Regional access to Boise Air Terminal Airport and Boise AGS is provided by the major east–west highway in southeastern Idaho, I–84 (which also defines the northern boundary of the airport). I–84 reaches a western terminus in Portland, Oregon, where it connects with Interstate 5, and an eastern terminus near Salt Lake City at I–80. Access to Boise Air Terminal Airport and Boise AGS is provided by several roads, including I–84, Gowen Road, Orchard Street, Vista Avenue, and Broadway Avenue. Primary access to Boise AGS's Idaho ANG is provided by Gowen Road from the east and Orchard Street from the west (Boise 2008a).

In the vicinity of the airport, I–84 is a four-lane interstate freeway with 12-foot-wide travel lanes and shoulders at least 6 feet wide. Posted speed limits on I–84 are 65 miles per hour from west of the Orchard Street interchange to east of the Broadway Avenue interchange, and 75 miles per hour east of the Broadway Avenue interchange.

Gowen Road is a two-lane, minor arterial roadway that runs roughly east–west and roughly outlines the southern boundary of the airport. The posted speed limit on Gowen Road in the vicinity of the airport is 35 miles per hour. The Gowen Road/I–84 interchange is a basic diamond configuration with one entry lane and one exit lane and serves as the primary access roadway for Boise AGS.

Orchard Street, a north–south principal arterial roadway that generally forms the western boundary of the airport, provides access to Boise AGS facilities on the southwestern part of Boise Air Terminal Airport before connecting with Gowen Road. The posted speed limit on

Orchard Street in the vicinity of the airport is 35 miles per hour. To the north, Orchard Street is a five-lane roadway that extends into downtown Boise, but is not used as a major access to downtown. The interchange is a basic diamond configuration with one entry lane, one exit lane, and traffic signals at both ramp terminals.

Broadway Avenue is a north–south, five-lane principal arterial roadway that serves as a major access route to eastern downtown Boise. The posted speed limit on Broadway Avenue in the vicinity of the airport is 35 miles per hour. Although the Broadway Avenue/I–84 interchange has high volume, very little traffic is directly related to the airport. The interchange is a basic diamond configuration with one entry lane, one exit lane, and traffic signals at both ramp terminals. South of the I–84 interchange, Broadway Avenue turns west and becomes Commerce Avenue, providing access to commercial/industrial facilities on the northeastern side of the airfield.

Vista Avenue, which serves as the primary access point to the airport, is a north–south, five-lane principal arterial roadway that provides a major access route to downtown Boise. The posted speed limit in the vicinity of the airport on Vista Avenue is 35 miles per hour. The interchange is a basic diamond configuration with one entry lane, one exit lane, and traffic signals at both ramp terminals.

A roadway capacity analysis was recently conducted for a highway-improvement project on I-84, analyzing several thoroughfares and ramps providing access to the airport. It was found that several areas were severely congested during morning and/or evening rush hour. These include I–84/Orchard Street on- and off-ramps, I–84/Vista Avenue on- and off-ramps, westbound I–84/Broadway Avenue on-ramp, eastbound I–84/Broadway Avenue off-ramp, Gowen Road/I–84 westbound on- and off-ramp intersections, and Broadway Avenue/I–84 eastbound on- and off-ramp intersections. Each of these experience severe, high-density traffic flow, flow at or near capacity levels, or breakdowns in traffic flow (equating to a Level of Service rating of D, E, or F, as determined by the Transportation Reserve Board). Improvements are generally recommended for such traffic areas to alleviate congestion and provide better access to the airport and, as such, multiple construction projects are either currently taking place or are projected (Boise 2010c).

The Boise AGS installation is located in the southern portion of Boise Air Terminal Airport. Several large commercial air carriers operate from the terminal, including Delta, Frontier, Horizon, Sky West, Southwest, United, and US Airways with services to major metropolitan areas and transportation hubs such as Denver, Las Vegas, Chicago, Seattle, Minneapolis/Saint Paul, and Salt Lake City. Several charter and rental aircraft operators conduct operations from the terminal. A new ATCT was recently constructed and is the tallest structure in Idaho (Boise 2010c).

Public transportation for Ada and Canyon Counties is provided by Valley Regional Transit, which owns and operates the public bus system in Boise and contracts for transit services for Nampa/Caldwell and between Ada and Canyon Counties. Valley Regional Transit operates three bus routes from various destinations in Boise to the airport. Sun Valley Express operates daily bus service between Boise Air Terminal Airport and Sun Valley, Idaho, and the company also operates regional on-demand charter transportation services from the airport. No regional

passenger rail services are available from Boise. Union Pacific operates a freight railway that serves Boise, with one termination point located at Boise Air Terminal Airport.

Gate Access. The Boise AGS installation can be accessed by three gates. Twenty-four hour access to the installation is provided by the main gate at Farman Street, located at the southern end of the installation, and is accessed via Gowen Road. A second gate is located at Ellsworth Street and is used primarily during rush hour, but is also open on unit training assembly weekends. A third gate on Harvard Street, on the west end of the installation, provides access to contractor vehicles (NGB 2007).

On-Installation Circulation. Principal roads on the installation include Farman Street, Ingalls Street, and Arnold Street (major north–south routes); Aeronca Street (provides access to the flight line); and Dorman Street, Ellsworth Street, and Harvard Street (east–west routes with gate access from Orchard Street). Pauling Way provides access to the munitions storage area (NGB 2007).

BO 3.14.1.2 Base Environmental Consequences

Construction-Related Impacts. Implementation of any of the three scenarios would require delivery of materials to and removal of construction-related debris from construction and renovation sites. However, construction traffic would make up only a small portion of the total existing traffic volume in the area and at the installation. Increased traffic during construction could contribute to degradation of the internal road surfaces, additional congestion at the main gate, and delays in the processing of access passes. The potential for short-term increases in traffic are not likely to substantially affect commute times. No long-term impacts on- or off-base transportation systems would result.

Operations. Under Scenario B1, approximately 680 personnel would be added to support the F-35A, resulting in a 38 percent increase of full-time personnel and a similar increase in daily commuting traffic to and from Boise AGS. In addition to the increase in personnel, there would be a small increase in dependent and commercial traffic. This assumes that all personnel and dependents live off base, work standard workdays, and drive individually to the installation. This increase would require the use of the Ellsworth Street gate, in addition to the main gate, on a daily basis to handle peak traffic in the mornings and evenings. The ANG already opens this gate on drill weekends, when the installation population climbs from 1,550 on a weekday basis to 3,500. In addition, Ada County has planned for the installation of a signal at the intersection of Farman Street (main gate access) and Gowen Road to improve traffic flow into and out of the installation. Therefore, implementation of Scenario B1 would be accommodated with these changes without increased congestion to the local transportation system.

If Scenario B2 is selected, ANG personnel would increase by approximately 1,220 resulting in a 71 percent increase in full-time personnel reporting to work each day. This increase would result in a similar percentage increase in daily commuting traffic to and from Boise AGS. In addition to the increase in personnel, there would be a small increase in dependent and commercial traffic. To accommodate this level of increase, the Ellsworth Street gate would be opened on a full-time basis, and the installation would institute flextime to distribute the peak traffic loads across a greater time period. These actions, along with the planned improvement

to the intersection of Farman Street (Main Gate access) and Gowen Road, including the synchronization of the current signal at the Main Gate access for peak traffic, would assist in maintaining an adequate level of service on the roads providing access to the installation.

With the selection of Scenario B3, ANG personnel would increase by approximately 1,760 personnel, resulting in a 135 percent increase of full-time personnel reporting to work each day. This increase would result in a similar percentage increase in daily commuting traffic to and from Boise AGS. In addition to the increase in personnel, there would be a small increase in dependent and commercial traffic. To accommodate this level of increase, the changes and improvements noted under Scenario B2 would be implemented, and additional improvements, including an additional gate, would be considered to reduce the potential effect on Gowen Road.

BO 3.15 Hazardous Materials and Waste

BO 3.15.1 Base

BO 3.15.1.1 Base Affected Environment

Hazardous Materials and Waste. Hazardous materials and petroleum products are used throughout the Boise AGS installation for many functions, including fueling operations; vehicle, airplane, and helicopter maintenance; cleaning of offices, dining halls, and living quarters; and training operations. These activities require the use of batteries, oils, lubricants, paints, thinners, fuels, and solvents.

Hazardous waste management at the Boise AGS installation adheres to Resource Conservation and Recovery Act regulations and is guided by the site-specific Hazardous Waste Management Plan (124 FW 2009). This plan establishes policies, assigns responsibilities, and provides guidance for proper management of hazardous waste. Hazardous and petroleum waste-generating operations include ground vehicle, airplane, and helicopter maintenance; vehicle painting; electronics and radio equipment maintenance; training exercises support; and overall base maintenance. These hazardous wastes include varying quantities of used petroleum, oil, and lubricant products and waste acids; paints; thinners; strippers; and solvents. These wastes are tracked to ensure proper identification, storage, transportation, and disposal, as well as implementation of waste minimization programs. Boise AGS is a small-quantity generator of hazardous waste; therefore, these wastes are managed in accordance with small-quantity generator regulations.

Installation Restoration Program Sites. The DoD Installation Restoration Program (IRP) is designed to identify, evaluate, and remediate sites where activities may threaten public health, welfare, or the environment. A Phase I Preliminary Assessment, conducted on the Boise AGS facilities in 1985, identified 13 potentially contaminated sites. Six sites were not investigated further (IRP Sites 7, 8, 9, 10, 11, and 13). One site (IRP Site 12) was remediated prior to the site inspection. A Phase II Site Investigation was conducted on 6 sites (IRP Sites 1 through 6) from 1989 to 1994. The 6 sites have received No Further Action status. IRP Site 1, Fire Training Area, is still active, with remedial action tentatively planned for fall 2011. Boise AGS is working with IDEQ towards closure of the site by 2012. The remaining IRP sites are no longer active.

Various storage tanks were used at the installation to store gasoline, diesel fuel, fuel oil, and waste oil. In addition, the installation uses OWSs to separate oils, fuels, sand, and grease from wastewater and to prevent contaminants from entering the sanitary sewer and storm water drainage systems. A total of 16 aboveground storage tanks and 8 underground storage tanks are currently installed at Boise AGS.

Toxic Substances. The ANG and the Army National Guard conducted asbestos surveys at selected buildings within the installation. Asbestos was found in the floor tile, tile mastic, thermal insulation, wall coverings, fire protection insulation, transite sheeting, and ceiling tile of buildings listed in the survey (124 AW 2000). All of the ACM was found to be in good condition and did not require immediate actions to prevent releases of fibers; however, some buildings were listed for removal as part of the normal maintenance and repair cycle. The buildings built prior to 1980 that were not surveyed by the ANG or Army National Guard are suspected of containing asbestos based on age and determination of asbestos in similar buildings. These include Buildings 411, 415, 1105, 1112, 1114–1124, 1500, 1522, and 1524. However, no visible ACM was identified during the December 1999 visual site inspection in these buildings.

There are 178 buildings that were constructed prior to 1979 and, thus, have the potential to contain LBP (124 AW 2000). Although there have not been any LBP assessments conducted at the installation, most of the visible painted surfaces of these buildings were in good condition during the December 1999 visual site inspection. This does not preclude any of the buildings from containing an undercoat of LBP; however, it does indicate that if LBP has been used, it is in good condition. LBP testing would be performed prior to any renovation or demolition activity within these buildings (124 AW 2000).

BO 3.15.1.2 Base Environmental Consequences

Hazardous Materials and Wastes. Under the F-35A aircraft beddown scenarios, the quantities of hazardous materials and petroleum substances used throughout Boise AGS may increase slightly in the long term due to the net increase in aircraft. The F-35A aircraft has a composite body and should require less painting. Paint waste is a major component of the base's current waste stream. Short-term increases in the quantities of hazardous materials and petroleum substances are expected and would be realized in terms of the quantity of fuel stored and used during construction activities because various fuels (e.g., diesel, gasoline) would be required to run earthmoving equipment and power tools and to provide electricity and lighting as conditions warrant. In addition, the number of sites storing, using, and handling hazardous materials may change slightly under the F-35A aircraft beddown scenarios; however, the authorization process already in place for the acquisition of these materials would ensure that only the specific types and quantities necessary to carry out the mission would be brought to Boise AGS.

The quantity of hazardous waste generated at Boise AGS would increase as additional aircraft are serviced under Scenarios B1, B2, and B3. Boise AGS may have to change its status to large quantity generator pursuant to the Resource Conservation and Recovery Act. If any new hazardous waste generation or handling areas (e.g., Satellite Accumulation Points or Central Accumulation Points) are established as a result of the F-35A aircraft beddown scenarios, they

would be managed in accordance with the installation's Hazardous Waste Management Plan, which would be updated to reflect the changes.

Installation Restoration Program Sites. Boise AGS has one active IRP site, IRP Site 1, Fire Training Area. Excavations needed during the demolition, construction, or operational phases under the F-35A aircraft beddown scenarios are not expected to impact IRP sites.

Toxic Substances. Prior to any demolition associated with the F-35A aircraft beddown scenarios, surveys would be conducted to determine the presence of ACMs. If ACMs are present, Boise AGS would employ appropriately trained and licensed contractors to perform the ACM removal work and would notify the contractors of the presence of ACMs so that appropriate precautions could be taken to protect the health and safety of the workers. ACMs would be segregated for disposal and managed in accordance with applicable Federal, state, and local regulations.

Prior to any demolition associated with the F-35A aircraft beddown scenarios, surveys would also be conducted to determine the presence of LBP. If LBP is present, Boise AGS would employ appropriately trained and licensed contractors to perform work involving the LBP and would notify the contractor of the presence of LBP so that appropriate precautions could be taken to protect the health and safety of the workers.

BO 4.0 Boise AGS Cumulative Effects and Irreversible and Irretrievable Commitment of Resources

CEQ regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person (Federal or non-Federal) undertakes such other actions" (40 CFR 1508.7). In this section, an effort has been made to identify past and present actions in the Boise AGS region and those reasonably foreseeable actions that are in the planning phase or unfolding at this time. Actions that have a potential to interact with the beddown of F-35A at Boise AGS are included in this cumulative analysis. This approach enables decisionmakers to have the most current information available so that they can evaluate the environmental consequences of the beddown of F-35A aircraft at Boise AGS, use of the auxiliary airfield at Mountain Home AFB, and training in associated airspace.

Boise AGS is an active military installation with units of Idaho ANG; the Army National Guard; and reserve units of the U.S. Army, Navy, and Marines Corps. The installation undergoes changes in mission and in training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the installation requires new construction, facility improvements, infrastructure upgrades, and other maintenance/repairs on a nearly continual basis. Although known construction and upgrades are a part of the analysis contained in this document, some future requirements cannot be predicted. As those requirements surface, future NEPA analysis will be conducted, as necessary.

BO 4.1 Past, Present, and Reasonably Foreseeable Actions

Until the mid-1990s, the mission of the 124 FW at Boise AGS involved training and operation of F-4 fighter aircraft. As the F-4 was phased out of active duty, the 124 WG transitioned into a role of providing Close Air Support and tactical airlift missions with the A-10 Thunderbolts and C-130 Hercules transport aircraft. Under the 2005 Defense Base Realignment and Closure recommendations, Boise AGS continues to operate A-10 Thunderbolts, but its four C-130 aircraft were realigned to the 153rd Airlift Wing in Cheyenne, Wyoming.

Table BO 4.1–1 summarizes past, present, and reasonably foreseeable actions within the region that could interact with the beddown of F-35A at Boise AGS. The table briefly describes each identified action, presents the proponent or jurisdiction of the action and the timeframe (e.g., past, present/ongoing, future), and indicates which resources potentially interact with the beddown of F-35A at Boise AGS. Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the region surrounding Boise AGS and training airspace.

Table BO 4.1–1. Past, Present, and Reasonably Foreseeable Actions at Boise AGS and Associated Region

Action	***Proponent/ Location***	***Timeframe***	***Description***	***Resource Interaction***
Military Actions				
Final Environmental Assessment for Proposed Airspace Changes for Paradise East and West MOAs at Mountain Home AFB, Idaho	Air Combat Command	Past	Expansion of the lateral and vertical boundaries of Paradise East and West MOAs, including the lowering of the MOA floors from 14,500 feet MSL to 10,000 feet or 3,000 feet AGL, whichever is higher, and the addition of approximately 16,985 cubic NM of training airspace. Airspace changes were proposed to meet the 366 FW requirement to train fighter aircrews in offensive and defensive operations. The expanded airspace was charted in fall of 2011.	F-35A operations are distributed to the expanded airspace.
Proposed Basing of Operational F-35A Aircraft at Mountain Home AFB, Idaho	Air Combat Command	Future	Mountain Home AFB is one of five locations under consideration for basing of between one to three squadrons of F-35A aircraft that perform the operation mission. Mountain Home AFB is not the Air Force's preferred location. The new aircraft are proposed and would be additional to existing F-15 aircraft stationed at the base. The F-35A operational wing aircraft would use the same airspace as the current mission and proposed F-35A training mission in this EIS. No new airspace is proposed, but operations and noise levels would be additional to those evaluated for this EIS.	Airspace Management and Use, Noise, Land Use and Recreation, Air Quality at auxiliary airfield and training airspace.
Environmental Assessment for the Implementation of the BRAC – Final Recommendations for the Mission Change and Construction Activities for the 124 FW at Boise Air Terminal Airport, Boise, Idaho	Idaho ANG	Past	Implementation of 2005 BRAC decisions for the 124 FW to provide properly sized and configured facilities for mission requirements. Actions included: establishment of 18 A-10 PAA at the installation; distribution of 4 C-130H aircraft from the installation; multiple construction projects, including a new operations and training facility, new ANG transient housing, new truck/delivery gate parking lot repair, and relocation of the munitions storage area.	Cultural Resources, Soil Resources, Water Resources at installation.
Focused Environmental Assessment for Proposed Temporary Relocation of the 173 FW to Gowen Field ANG Base (Boise AGS)	Oregon ANG	Past	Temporary relocation of the 240 personnel, 25 F-15 aircraft, and associated equipment of the 173 FW in Klamath Falls, Oregon, to Gowen Field ANG Base (Boise AGS). While relocated, the 173 FW would conduct approximately 1,800 sorties in existing regional SUAs over the 6-month relocation period.	Airspace Management and Use, Air Quality, Noise, Land Use at installation.

Action	Proponent/ Location	Timeframe	Description	Resource Interaction
Military Actions (continued)				
Environmental Assessment for Republic of Singapore Air Force F-15SG Beddown, Mountain Home AFB, Idaho	Air Combat Command	Past	Establishment of a Foreign Military Sales squadron (from the Republic of Singapore Air Force) within the 366 FW at Mountain Home AFB. Beddown of up to 20 operational F-15SG aircraft, personnel, and equipment would include increased airfield operations and sorties in Restricted Areas, MOAs, and MTRs; basing of 179 Republic of Singapore Air Force and 128 support personnel; and construction, modification, and demolition of facilities.	Included in baseline conditions.
Proposed Stand-Up of a Foreign Military Sales (FMS) F-15 squadron from the Royal Saudi Air Force at Mountain Home AFB, Idaho.	Air Combat Command	Future	Stand-up of an F-15SA squadron from the Royal Saudi Air Force at Mountain Home AFB with 12 Primary Aircraft Inventory. Airfield operations would be conducted at Mountain Home AFB and sortie-operations would be conducted in the Mountain Home Range Complex and IR-300, IR-303, and IR-304.	Airspace Management and Use, Noise.
Environmental Assessment for the Employment of 2.75-inch Rockets at Saylor Creek Air Force Range	Mountain Home AFB	Past	Evaluates the use of 2.75-inch rockets with various warheads on Saylor Creek Range. Finding of No Significant Impact was signed allowing the use of white phosphorous, training munitions, and illumination rockets on Saylor Creek.	Included in baseline conditions.
Non-Military Federal				
BLM Gateway West Transmission Line Draft EIS 2011	Idaho Power, Rocky Mountain Power, BLM	Ongoing	Idaho Power and Rocky Mountain Power request a right-of-way grant to use the National System of Public Lands for a portion of the land needed to construct the Gateway West Transmission Line. The Gateway West Transmission Line would extend approximately 1,100 miles from near Glenrock, Wyoming, to a substation approximately 30 miles south of Boise, Idaho. Portions of the transmission line would run beneath the Jarbidge MOAs and near the Saylor Creek Range Restricted Area.	Airspace Management, Safety.
BLM Cottonwood Field Office RMP/EIS 2009	BLM Cottonwood Field Office	Ongoing	Resource Management Plans/Environmental Impact Statement (RMP/EIS) for over 130,000 acres of BLM managed land in north–central Idaho. Actions in the RMP/EIS include species management, fuel treatment, mineral management, timber sales, riparian management, and the creation of several new special management areas.	Biological Resources, Land Use, Soil Resources, Water Resources under training airspace.
BLM Four Rivers Field Office RMP/EIS	BLM Four Rivers Field Office	Ongoing	RMP/EIS for BLM-managed land in west–central Idaho.	Biological Resources, Land Use, Soil Resources, Water Resources under training airspace.

Action	*Proponent/ Location*	*Timeframe*	*Description*	*Resource Interaction*
BLM Jarbidge Field Office Revised RMP/EIS	BLM Jarbidge Field Office	Ongoing	RMP/EIS for over 1.4 million acres of public land in southwestern Idaho.	Biological Resources, Land Use, Soil Resources, Water Resources under training airspace.
Ridgeline Energy Owyhee Wind Energy Anemometers Environmental Assessment	BLM Owyhee Field Office	Ongoing	Construction of five 200-foot-tall towers to assess regional wind potential and to evaluate the feasibility of developing a turbine-generated wind energy facility located on public land in Owyhee County.	Biological Resources, Cultural Resources, Safety, Visual Resources under training airspace.
China Mountain Wind Energy Development EIS	BLM Jarbidge Field Office	Ongoing, future	As a part of the China Mountain Wind Power Project, the development of (and right-of-way for) a 425-megawatt wind energy facility consisting of up to 185 wind turbines on approximately 30,700 acres in the Jarbidge Foothills on the Idaho–Nevada border.	Airspace Management and Use, Biological Resources, Land Use, Safety, Visual Resources under training airspace.
State and Local				
Boise Airport Master Plan Update 2009	Boise Air Terminal Airport	Ongoing, future	Maintenance, continuation, and improvement of airport operations. The plan also identifies short- and long-term improvement projects (phased to 2027) to accommodate future growth. Short-term (2008–2017) plans include airfield extensions (extension of Runway 10R/28L and Taxiway B, extension and development of Runway 9-27 and associated taxiways), parking lot expansion, new snow removal equipment facility, new cargo facility, expansion of the General Aviation area, development of Concourse A terminal, a new Customs and Border Protection facility, and new heliport/helipads. Long-term projects (2018–2027) include Concourse A expansion, main terminal expansion, a second Airport Rescue and Fire Fighting facility, and relocation of the National Interagency Fire Center and Idaho Transportation Department Division of Aeronautics facilities.	Airspace Management and Use, Land Use, Noise, Safety at installation.
Proposed new parks to southeast and northwest of airport	Boise Parks and Recreation Department	Future	Multiple proposed new parks identified for the Boise Parks and Recreation Department, including up to four within about 3 to 5 miles to the southeast of the airport and to the north, possibly within expanded airport area of effect.	Land Use, Noise, Recreation at installation.

BO 4.2 Cumulative Impacts

The following analysis considers how the impacts of the actions in Table BO 4.1–1 might affect or be affected by the F-35A beddown scenarios at Boise AGS. The analysis considers whether such a relationship would result in potentially significant impacts not identified when the beddown of F-35A at Boise AGS is considered alone.

Boise AGS. Implementation of recent changes in mission at the installation, in combination with projected construction under the Boise AGS F-35A scenarios and future expansion of the airport's runways and terminal facilities, is spread over time so that construction impacts (noise, equipment emissions, dust, and potential storm water issues) would not occur all at one time. Sound engineering and management practices would minimize construction impacts. Additional impervious surface at the airfield would require installation of appropriate storm water system improvements. Use of a planned new runway to the southeast of the existing runways could substantially reduce noise effects of military aircraft on the area surrounding Boise AGS. Aircraft operations noise would be shifted to less populated areas. Airport expansion would require additional environmental analysis in the future. Coordination between the City of Boise, Ada County, airport operators, and Boise AGS would minimize potential for incompatible development within the AIA.

Auxiliary Airfield. Recent changes in mission at Mountain Home AFB are reflected in the current baseline operations. The proposal to base up to 72 operational F-35A aircraft at Mountain Home AFB and use the airfield for F-35A aircraft training operations (pattern work) would generate a substantial increase in operations at the airfield and the immediate surrounding areas; however, construction impacts of the operational and training F-35A beddowns would not overlap geographically, so construction impacts and ground maintenance functions of the two actions would not cause cumulative local impacts on physical resources (such as soils, water, and air quality). Most of the impacts would be related to flight operations at the airfield and higher cumulative noise levels. These could affect land uses on Mountain Home AFB and expose some occupied facilities to noise levels above 80 dB DNL. Outside the base, noise levels above 65 dB DNL could extend as far as the C.J. Strike Dam Recreation Annex and affect the quality of outdoor recreation at this facility. The airfield is not in a nonattainment area for any pollutants, although combined operations could substantially increase local air emissions at the airfield.

Regionally, the addition of up to 144 F-35A training and operational aircraft would bring substantial gains in personnel and family members and additional expenditures for capital investments and personal spending. This would provide a stimulus for the local economies of Boise and Mountain Home and related counties. Potential capacity issues for local housing, schools, and human services could require additional coordination and planning between the Air Force and local jurisdictions to ensure that services are not negatively affected for existing residents and the new population.

Training Airspace. The expansion of what was referred to as the "Paradise East and West MOAs" was completed and charted by the FAA in the fall of 2011. Baseline and projected F-35A operations have been allocated to the expanded airspace. The MHRC is used by both Boise AGS units and Mountain Home AFB units. Mountain Home AFB is also being considered

for the beddown of F-35A operational aircraft. Conflicts in scheduling of airspace use and increased noise in the lands under the airspace could also result. For subsonic noise, the maximum combined noise levels in the Jarbidge North MOA/ATCAA and Owyhee North MOA/ATCAA would be 68 dB DNL_{mr} and 67 dB DNL_{mr}, respectively. The maximum combined noise level in the Saddle MOA/ATCAAs and Paradise MOA/ATCAAs would be 53 dB DNL_{mr} and 46 dB DNL_{mr}, respectively, and the maximum combined noise level in the Jarbidge South MOA/ATCAA and Owyhee South MOA/ATCAA would remain at or below 45 dB DNL_{mr}. These levels would produce perceptible changes from baseline conditions. Cumulative noise levels from the use of the airspace would increase by up to 5 dB CDNL over baseline conditions in the Paradise MOA/ATCAAs, Owyhee South MOA/ATCAA, and Jarbidge South MOA/ATCAA and by 4 dB in the Owyhee North and Jarbidge North MOA/ATCAA. Sonic booms per day would increase by 124 percent beneath Owyhee North MOA/ATCAA, by 139 percent beneath Jarbidge North MOA/ATCAA, and by 195 percent beneath Paradise MOA/ATCAAs, Owyhee South MOA/ATCAA, and Jarbidge South MOA/ATCAA.

The proposed beddown of a Royal Saudi Air Force unit at Mountain Home AFB would also increase sortie-operations and noise levels, generating additional impacts. If the Royal Saudi Air Force beddown, the F-35A beddown at Mountain Home AFB, and the F-35A beddown at Boise AGS were to all take place, the maximum combined noise levels in the Jarbidge North MOA/ATCAA and Owyhee North MOA/ATCAA would be 69 dB DNL_{mr} and 68 dB DNL_{mr}, respectively. The maximum combined noise level in the Saddle MOA/ATCAAs and Paradise MOA/ATCAAs would be 53 dB DNL_{mr} and 46 dB DNL_{mr}, respectively, and the maximum combined noise level in the Jarbidge South MOA/ATCAA and Owyhee South MOA/ATCAA would remain at or below 46 dB DNL_{mr}. These levels would produce perceptible changes from baseline conditions. Cumulative noise levels from the use of the airspace would increase by up to 5 dB CDNL over baseline conditions in the Paradise MOA/ATCAAs, Owyhee South MOA/ATCAA, and Jarbidge South MOA/ATCAA. Noise levels would increase by 4 dB in the Owyhee North MOA/ATCAA and by 5 dB in the Jarbidge North MOA/ATCAA. Sonic booms per day would increase by 165 percent beneath Owyhee North MOA/ATCAA, by 183 percent beneath Jarbidge North MOA/ATCAA, and by 227 percent beneath Paradise MOA/ATCAAs, Owyhee South MOA/ATCAA, and Jarbidge South MOA/ATCAA.

If the Royal Saudi Air Force beddown and the F-35A beddown at Boise AGS were to take place, but the F-35A beddown at Mountain Home AFB were to not take place, airspace noise levels would be slightly less than if all three missions were to beddown. The maximum combined noise levels in the Jarbidge North MOA/ATCAA and Owyhee North MOA/ATCAA would be 68 dB DNL_{mr} and 67 dB DNL_{mr}, respectively. The maximum combined noise level in the Saddle MOA/ATCAAs and Paradise MOA/ATCAAs would be 53 dB DNL_{mr} and 45 dB DNL_{mr}, respectively, and the maximum combined noise level in the Jarbidge South MOA/ATCAA and Owyhee South MOA/ATCAA would remain at or below 45 dB DNL_{mr}. Cumulative noise levels from the use of the airspace would increase by up to 2 dB CDNL over baseline conditions in the Paradise MOA/ATCAAs, Owyhee South MOA/ATCAA, and Jarbidge South MOA/ATCAA and by up to 4 dB in the Owyhee North and Jarbidge North MOA/ATCAA. Sonic booms per day would increase by 115 percent beneath Owyhee North MOA/ATCAA, by 134 percent beneath Jarbidge North MOA/ATCAA, and by 53 percent beneath Paradise MOA/ATCAAs, Owyhee South MOA/ATCAA, and Jarbidge South MOA/ATCAA.

These changes in the noise levels would be perceptible. Coordination with affected communities and jurisdictions on potential avoidance procedures could provide some reduction in impacts for selected locations but would not tend to reduce noise to quiet levels. Effects of noise on wildlife, air quality, and cultural resources would be similar to those described in each resource section in this EIS, but would be proportionately increased if all of these actions were implemented. Capacity of various MOAs to support combined operations safely may require further consideration. Higher levels of activity could add to the workload of air traffic controllers and generate a need for additional airspace management personnel.

In general, the resource management actions by the various Federal land managers would not overlap with the use of regional airspace. However, some activities would interact and require local coordination, such as controlled burning, which can cause localized smoke that could be hazardous to high-speed military flying operations. The planning and siting of new wind farm facilities (such as the proposed China Mountain Wind Energy project), placement of communication towers, and construction of transmission line towers as part of the Gateway West Transmission Line pose compatibility concerns. A military airspace regional coordinator could serve as a representative to assist with mutually compatible long-term sustainable solutions between responsible Federal agencies.

BO 4.3 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For the beddown of F-35A aircraft at Boise AGS, most resource commitments are neither irreversible nor irretrievable. Most impacts are short term and temporary, such as air emissions from construction, or longer lasting but negligible, such as public service increases. Increases in sonic booms would not be negligible. However, the duration of individual booms would be extremely brief. Those limited resources that may involve a possible irreversible or irretrievable commitment are discussed below.

If Boise AGS is the chosen beddown location, some land on the south side of the airfield would be disturbed. Much of this land has been previously disturbed and is heavily influenced by airfield development. Construction and renovation of base facilities would require the consumption of limited amounts of material typically associated with interior renovations (wiring, insulation, windows, drywall) and exterior construction (concrete, steel, sand, brick). An undetermined amount of energy to conduct renovation, construction, and operation of these facilities would be expended and irreversibly lost.

Training operations would continue and would involve consumption of nonrenewable resources, such as gasoline used in vehicles and jet fuel used in aircraft. None of these activities are expected to significantly decrease the availability of minerals or petroleum resources. Personal vehicle use by the personnel continuing to support the existing missions would consume fuel, oil, and lubricants. The amount of these materials used would increase slightly; however, this additional use is not expected to significantly affect the availability of the resources.

Alternative

Holloman AFB

You are in the Holloman AFB section.

This page is intended to help you find specific information about Holloman AFB and to clarify this section's relation to the rest of the EIS.

Overall Proposal

Table of Contents, List of Figures, List of Tables, and Acronyms and Abbreviations

Preface: Detailed Guide for Reading the EIS → Go back to the Preface for a detailed guide for reading the EIS.

Chapter 1: Purpose and Need for F-35A Training Basing → Go back to Chapter 1 for an explanation of the decision made by Congress to provide the U.S. Air Force with a next-generation fighter. Also described are the features of the F-35A, how the F-35A will be based, and how aircrews will train for their operational assignments.

Chapter 2:
- Overview of Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of Proposed Action and Alternatives

→ Go back to Chapter 2 for an overview of the Proposed Action and alternatives, which is to beddown the F-35A at Boise AGS, Holloman AFB, Luke AFB, and/or Tucson AGS.

Chapter 3: Resource Definition and Methodology for Analysis → Go back to Chapter 3 for a definition of the environmental resources that could potentially be affected by the Proposed Action and an explanation of the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base-Specific Information

BO-Boise AGS Alternative

See Boise AGS Section

HO-Holloman AFB Alternative

Section HO 1.0
Introduction

Section HO 2.0
Detailed Description of Action

Section HO 3.0
Affected Environment and Environmental Consequences

Aircraft Operations
- HO 3.1 Airspace Management and Use
- HO 3.2 Noise
- HO 3.3 Air Quality
- HO 3.4 Safety

Natural Resources
- HO 3.5 Soils and Water
- HO 3.6 Vegetation and Wildlife
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Cultural and Traditional Resources
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Community and Infrastructure
- HO 3.13 Infrastructure
- HO 3.14 Transportation
- HO 3.15 Hazardous Materials and Waste

Section HO 4.0
Cumulative Effects and Irreversible and Irretrievable Commitment of Resources

LU-Luke AFB Alternative

See Luke AFB Section

TU-Tucson AGS Alternative

See Tucson AGS Section

This section of the EIS presents site-specific and resource-specific details on the existing environmental conditions of Holloman AFB. It also describes the potential environmental consequences of the proposed beddown of the F-35As at the base.

A summary of public and agency comments received during scoping is included in Section HO 2.2.3.

Comments received during the public review period of the Draft EIS, as well as Air Force responses, are included in Appendix D.

Overall Proposal

References	List of Preparers	Index	List of Repositories	Glossary	Appendices A, B, and C
Volume 1	Volume 1	Volume 1	Volume 1	Volume 1	Volume 2

DEIS Comments

Appendix D, D.1, D.2, and D.3	Appendix D, D.4 and D.5	Appendix D, D.6, D.7, D.8, and D.9	Appendix D, D.10
Receipt and Locating Comments	Alphabetical Directory	Copies of Letters and Transcripts	Response to Comments
Volume 2	Volume 2	Volume 2	Volume 2

HO 1.0 Holloman AFB Overview

As discussed in Chapter 2, Section 2.2.2, the U.S. Air Force (Air Force) identified potential candidate bases using specific planning conventions and processes, to include (among other issues) identifying the number of F-35A aircraft scheduled to be delivered between fiscal year (FY) 2013 and FY2017; identifying the number of F-35A aircraft to be allocated to training and to operations based on then-current national strategic considerations; and determining the number of bases minimally needed to support receipt of these aircraft for training and operations. This process resulted in the conclusion that 98 Primary Aircraft Authorized (PAA) is the current number of aircraft required for training.

In the intervening time between the Notice of Intent and public scoping and release of the Draft Environmental Impact Statement (EIS), the Air Force undertook a process to consider the realignment of F-16 aircraft to Holloman Air Force Base (Holloman AFB). Subsequent to completion of an Environmental Assessment and signing of a Finding of No Significant Impact (July 29, 2011), the Air Force issued a Basing Decision Memorandum (BDM) (August 4, 2011) to relocate two F-16 training squadrons consisting of 50 Primary Aircraft Inventory (PAI) and six Backup Aircraft Inventory (BAI) aircraft to Holloman AFB.

This section of Chapter 4 presents the operational and environmental factors specific to Holloman AFB. Section HO 2.0 explains that eight scenarios are being considered for Holloman AFB. These eight scenarios include three scenarios with a beddown of 24, 48, or 72 F-35A PAA in addition to the F-16 training mission (Scenarios H1W, H2W, and H3W).

Although the Air Force issued its BDM to relocate two F-16 training squadrons to Holloman AFB, for planning purposes, the Air Force is taking into consideration the beddown of 24, 48, 72, 96, or 120 PAA at Holloman AFB without the F-16 training mission (Scenarios H1, H2, H3, H4, and H5). This analysis is being accomplished to facilitate potential future decisionmaking with respect to F-35A basing and to provide for comprehensive National Environmental Policy Act planning.

The planning considerations used to identify candidate bases and aircraft numbers were the best current estimate. The actual number and configuration of aircraft potentially based at any time in the future will be determined by national security factors existing at the time of delivery and will be consistent with the results of this EIS and other related factors. Eventually, the number of aircraft assigned and bases used in support of the F-35A mission could change in light of national strategic considerations and F-35A production and availability.

Section HO 2.0 describes the specific actions at Holloman AFB that would be required for the beddown under each scenario. The environmental resources at Holloman AFB, as well as under its airspace, would be affected by the basing of an F-35A Pilot Training Center (PTC). These resources and the potential consequences are discussed in Section HO 3.0. Section HO 4.0 describes the cumulative actions and consequences and the irreversible and irretrievable commitment of resources that would be associated with a basing decision at Holloman AFB. Figure HO 1.0–1 shows the location of Holloman AFB and surrounding communities.

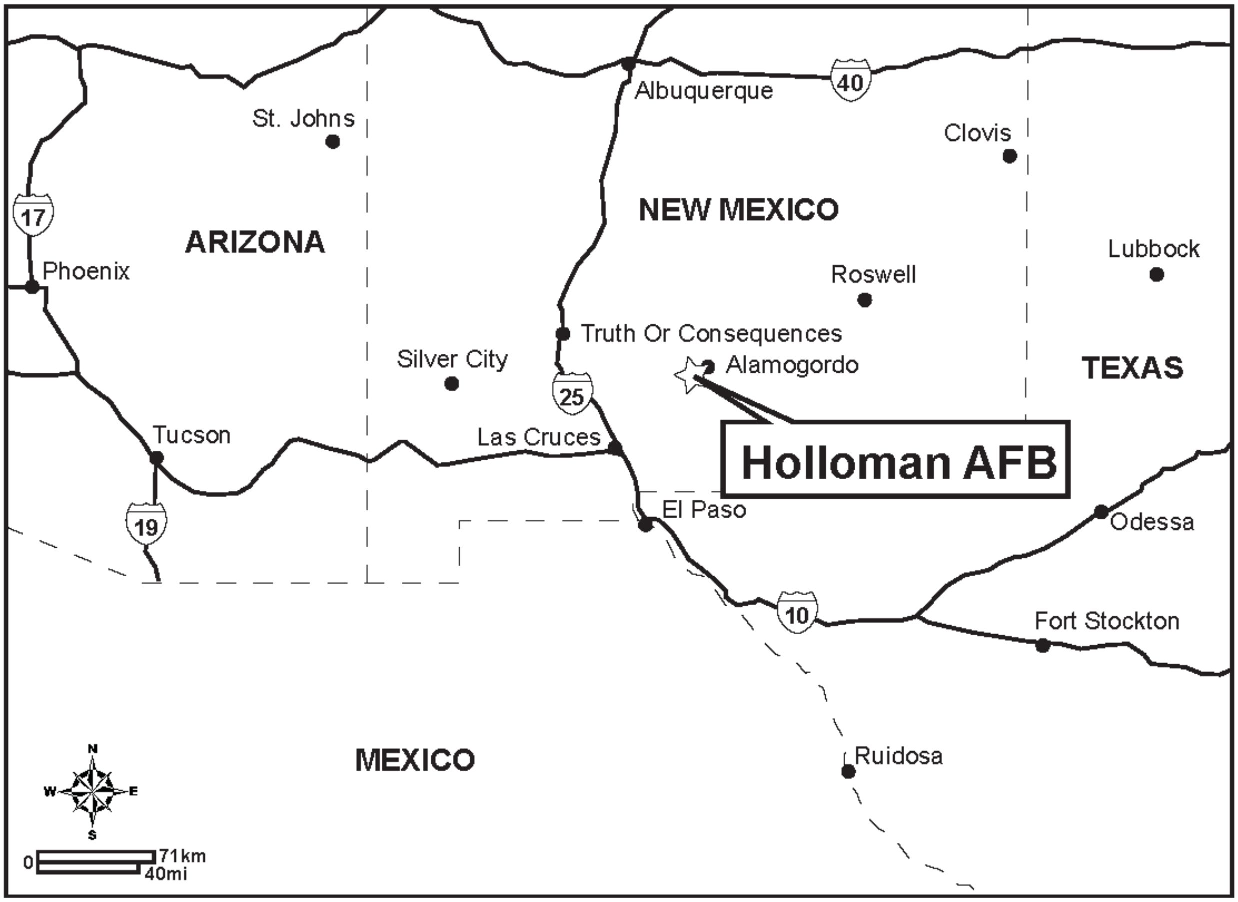


Figure HO 1.0–1. Vicinity of Holloman AFB, New Mexico

HO 2.0 Holloman AFB Alternative (Scenarios H1W, H2W, and H3W; Scenarios H1, H2, H3, H4, and H5)

This section details the actions that would occur at Holloman AFB, New Mexico, and in the associated training airspace if Holloman AFB were selected for the basing of an F-35A PTC.

Holloman AFB was evaluated by the Air Force to potentially beddown up to 144 F-35A aircraft. The Air Force determined it would further its strategic planning (as previously discussed in Section HO 1.0) by considering up to 120 F-35A PAA. The planning scenarios included in this EIS include 24 to 72 F-35A PAA with the assigned F-16 training mission and 24 to 120 F-35A PAA without the assigned F-16 training mission. These scenarios are consistent with the narrowing process discussed in Chapter 2, Section 2.2.2.

The Air Force developed a total of eight beddown scenarios for consideration, as described in Table HO 2.0–1. Scenarios H1W, H2W, and H3W evaluate the beddown of up to 72 F-35A PAA in addition to Holloman AFB's F-16 training mission. Scenarios H1, H2, H3, H4, and H5 evaluate the beddown of up to 120 F-35A PAA without the F-16 training mission. The MQ-1 (Predator) and MQ-9 (Reaper) remotely piloted aircraft (RPA) training mission and the tenant organizations, such as the German Air Force, are considered part of the baseline conditions for planning scenarios in this EIS. As described in Chapter 2, Section 2.5, the No Action Alternative for Holloman AFB constitutes the baseline conditions.

Table HO 2.0–1. Holloman AFB F-35A Aircraft Scenarios

Aircraft Scenario	*F-16 PAA*	*F-35A PAA*	*Total PAA at Holloman AFB*[1]
Baseline Conditions	50	0	50
Scenario H1W	50	24	74
Scenario H2W	50	48	98
Scenario H3W	50	72	122
Scenario H1	0	24	24
Scenario H2	0	48	48
Scenario H3	0	72	72
Scenario H4	0	96	96
Scenario H5	0	120	120

[1] PAA in this column includes only F-16 and F-35A PAA. Several other aircraft types are based at Holloman AFB, but these other aircraft are not part of, or changed by, the proposed F-35A beddown.

HO 2.1 Holloman AFB: Base

Three elements of this alternative have the potential to affect Holloman AFB and its immediate vicinity. These three elements are (1) airfield operations, (2) construction/renovation of facilities, and (3) personnel changes. Each is described in detail below. This EIS evaluates the environmental consequences of the beddown of F-35A aircraft under each aircraft scenario.

HO 2.1.1 Airfield Operations

Table HO 2.1–1 provides the number of annual airfield operations anticipated with the beddown of the F-35A training mission at Holloman AFB by each aircraft scenario. The 49th Wing (49 WG), the host at Holloman AFB, oversees MQ-1 and MQ-9 pilots and sensor operators' training, as well as all other tenant units at Holloman AFB. The 49 WG will be the host for the tenant unit 364 Fighter Group F-16 Formal Training Unit (FTU). At the completion of existing approved force structure changes, Holloman AFB would support 50 F-16 aircraft, 38 MQ-1 aircraft, 10 MQ-9 aircraft, 25 German Tornado aircraft, 10 T-38 aircraft, and 32 QF-4 and QF-16 drone aircraft.

Airfield operations are categorized as takeoffs, landings, closed patterns (including activities referred to as "touch-and-go operations," "go-arounds," or "low approaches"), or inter-facility transfers.

Table HO 2.1–1. Holloman AFB Baseline and Projected Annual Airfield Operations

	Baseline Annual Airfield Operations[1]	***Projected Annual F-35A Airfield Operations***				
		Scenarios H1W/H1 (24 Aircraft)	**Scenarios H2W/H2 (48 Aircraft)**	**Scenarios H3W/H3 (72 Aircraft)**	**Scenario H4 (96 Aircraft)**	**Scenario H5 (120 Aircraft)**
Scenarios H1W, H2W, and H3W						
F-35A	0	15,025	30,051	45,076	N/A	N/A
F-16	45,509	45,509	45,509	45,509	N/A	N/A
Other Military[1]	57,454	57,454	57,454	57,454	N/A	N/A
Total	**102,963**	**117,988**	**133,014**	**148,039**	**N/A**	**N/A**
Scenarios H1, H2, H3, H4, and H5						
F-35A	0	15,025	30,051	45,076	60,102	75,128
F-16	45,509	0	0	0	0	0
Other Military[1]	57,454	57,454	57,454	57,454	57,454	57,454
Total	**102,963**	**72,479**	**87,505**	**102,530**	**117,556**	**132,582**

[1] Other military includes the German Air Force, RPA, and other tenant units stationed at Holloman AFB.

Each increment of 24 F-35A aircraft would conduct 15,025 aircraft operations annually. Under Scenarios H1W, H2W, and H3W, the total number of airfield operations conducted at Holloman AFB annually would increase over baseline conditions between 15 percent under Scenario H1W and 44 percent under Scenario H3W. Under Scenarios H1 through H3, total annual airfield operations would decrease between 30 percent under Scenario H1 and less than 1 percent under Scenario H3. Under Scenarios H4 and H5, the change in total airfield operations at Holloman AFB would be an increase of 14 and 29 percent, respectively.

The percentage of F-35A departures expected to use afterburner has been adjusted from the generalized percentage shown in Chapter 2, Table 2–6, based on local flying conditions such as airfield elevation and runway length. At Holloman AFB, 7 training events in the F-35A training syllabus have the potential for the use of afterburners during takeoff. As the training syllabus consists of 58 total training events, approximately 12 percent of all F-35A departures would use afterburner to fulfill the training syllabus.

Of the 58 training events in the F-35A training syllabus, 10 have the potential for after-dark flights, constituting approximately 17 percent of the sorties under each aircraft scenario proposed to be conducted after sunset. Some of these night sorties would return after 10:00 p.m., particularly in the summer months, when sunset is late. Based on examination of recorded landing times at Holloman AFB and projections of scheduling issues under the proposed beddown scenarios, it is expected that the percentage of total sorties that land after 10:00 p.m. would be 4, 4, 5, 5, and 6 percent under scenarios in which 1, 2, 3, 4, and 5 increments of 24 F-35A aircraft are bedded down, respectively. Sorties conducted during "environmental night" (10:00 p.m. to 7:00 a.m.) are assigned an additional noise penalty of 10 decibels (dB) in calculation of certain noise metrics to account for low ambient noise levels and the increased potential for sleep disturbance.

The F-35A would employ similar departure, closed patterns, and landing procedures as currently used by Holloman AFB aircraft. F-35A operations would adhere to existing restrictions and avoidance procedures.

HO 2.1.2 Construction

Additional facilities and infrastructure would be required at Holloman AFB to support F-35A training operations. Table HO 2.1–2 lists the F-35A-related construction projects required for Scenarios H1W, H2W, and H3W. Because the F-35A mission would be in addition to the F-16 training mission, no facilities would be available for use. All of the facilities under these scenarios would require new construction. Figure HO 2.1–1 shows the area proposed for the F-35A campus. The F-35A campus would be approximately 80 acres under Scenario H1W, 84 acres under Scenario H2W, and 89 acres under Scenario H3W and would be constructed on the west side of Holloman AFB immediately south of the F-16 training campus.

The total disturbed area presented in Tables HO 2.1–2 and HO 2.1–3 comprises the total area covered by the construction footprints of the proposed facilities, plus an estimate of the surrounding lands where construction-related clearing and grading would occur. Construction activities are expected to begin in FY2012 and be complete by FY2014, when the first F-35A is expected to be bedded down. Portions of the three runways and taxiways at Holloman AFB are asphalt. These areas would need to be replaced with concrete for the F-35A beddown. Additional construction activities would include the construction of squadron operations and maintenance facilities, including a battery shop, composite repair facility, washrack, parking ramps, and aircraft shelters.

If Scenario H1, H2, H3, H4, or H5 were selected, existing facilities would accommodate some F-35A functions with renovation. Additional facilities would be required to beddown up to 120 aircraft under Scenario H5. Table HO 2.1–3 lists the renovation and construction activities required for Scenarios H1, H2, H3, H4, and H5.

Table HO 2.1–2. F-35A Construction at Holloman AFB Under Scenarios H1W, H2W, and H3W

Project	*No. of Aircraft*[1]	*Renovate*	*New/ Addition*	*Total Disturbed Area (square feet)*[2]
Taxiway	24		X	825,000
Parking Apron	24		X	31,680
Parking Apron	24		X	628,135
Arm/De-arm pad	24		X	3,300
Pad, Dangerous Cargo (8 LOLA spots)	24		X	69,795
Holding Area Munitions Storage	24		X	25,300
Squadron Operations/AMU (with Hangar space, shops, trailers)	24		X	85,800
Academic Training Center (3 Squadrons)	24		X	92,400
Maintenance Hangars (2 bay Weapons Load Training)	24		X	13,206
Battery Maintenance	24		X	880
Ejection Seat Maintenance	24		X	3,410
Engine Maintenance	24		X	1,100
Corrosion Control (2 bay, includes CRF inserts)	24		X	16,500
Corrosion Control (wash rack, 2 bay)	24		X	13,200
Fuel Cell Maintenance (2 bay)	24		X	13,200
Alternate Mission Equipment (AME) shop	24		X	42,900
Support (AGE) Maintenance facility	24		X	23,100
Storage Igloos (Munitions)	24		X	7,260
General Purpose Warehouse (Engine Storage)	24		X	11,904
ComSec space	24		X	1,540
Wing Headquarters	24		X	41,800
Billeting	24		X	33,141
School, Dependent Elementary	24		X	35,200
Fitness Center	24		X	16,500
Child Development Center	24		X	27,223
Electrical infrastructure	24		X	1 each
AGE Storage Area	24		X	9,900
Flightline Security Fence	24		X	129,932
Apron re-stripe	24		X	N/A
Squadron Operations/AMU (with Hangar space)	48		X	77,000
Dormitory	48		X	83,600
Billeting	48		X	33,141
Squadron Operations/AMU (with Hangar space)	72		X	77,000
Dormitory	72		X	83,600
Billeting	72		X	33,141
Operational Training Facility (FTD Classrooms)	24, 48, 72		X	13,662
Bulk Fuel Storage	24, 48, 72		X	33,000
Family Housing (500 homes)	24, 48, 72		X	1,210,000
Interim moves and relocations	24, 48, 72	X	X	23,100
Total for Scenario H1W (24 Aircraft)				**3,483,068**
Total for Scenario H2W (48 Aircraft)				**3,676,808**
Total for Scenario H3W (72 Aircraft)				**3,870,549**

[1] Construction for aircraft scenarios is additive, i.e., construction required for 72 aircraft includes all proposed construction under 24, 48, and 72 aircraft.

[2] Total disturbed area is estimated to be 10 percent larger than the footprint of the finished facility as a best engineering estimate to account for disturbance by construction activities, including laydown areas and utility connections.

Key: AGE=aerospace ground equipment; AMU=Aircraft Maintenance Unit; CRF=Composite Repair Facility; FTD=Field Training Detachment; LOLA=Live Ordnance Loading Area.

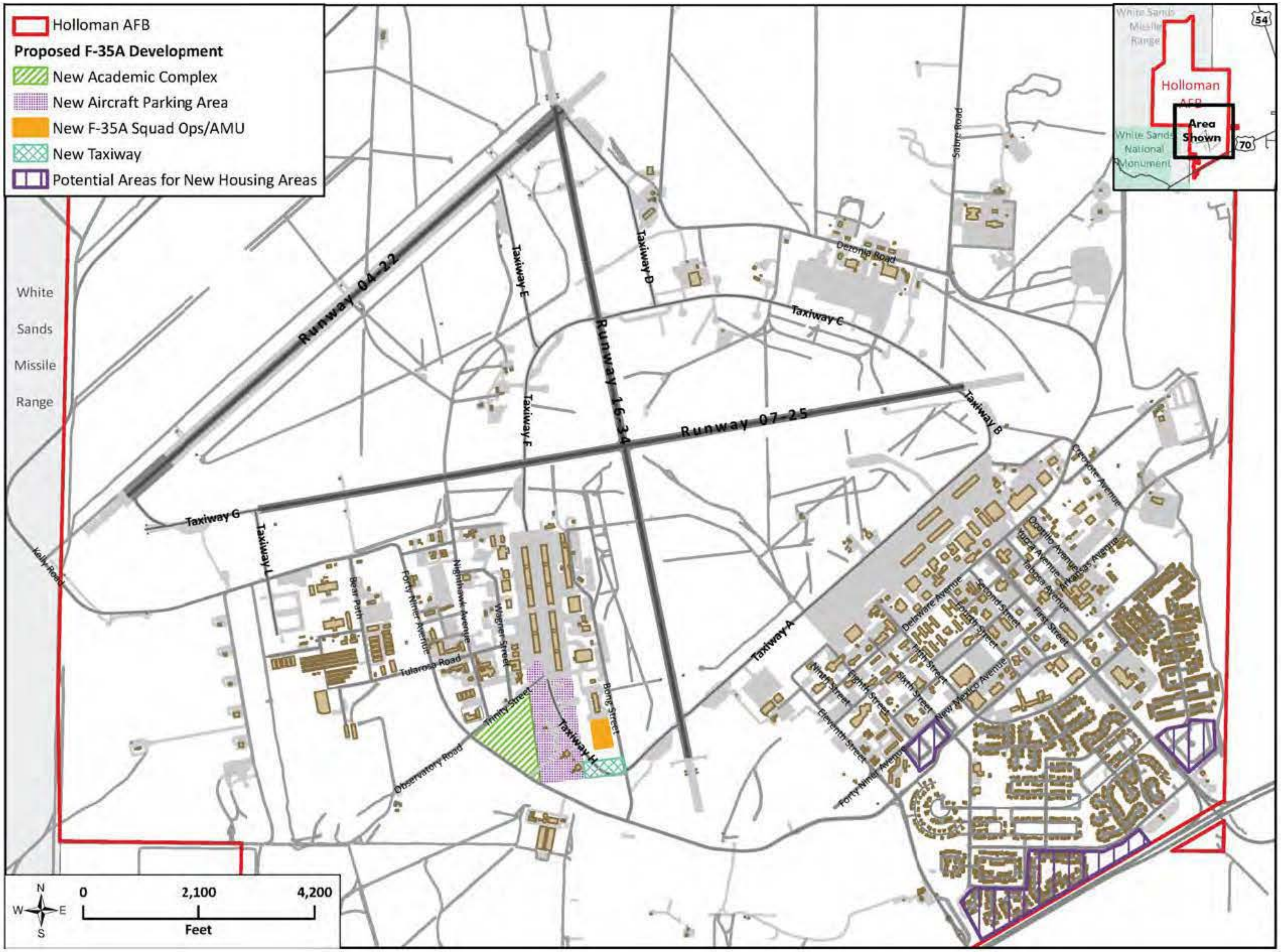


Figure HO 2.1–1. Holloman AFB F-35A Construction Area

Table HO 2.1–3. F-35A Construction at Holloman AFB Under Scenarios H1, H2, H3, H4, and H5

Project	***No. of Aircraft***[1]	***Renovate***	***New/ Addition***	***Total Disturbed Area (square feet)***[2]
Taxiway	24		X	825,000
Parking Apron	24		X	31,680
Arm/De-arm Pad	24		X	3,300
Pad, Dangerous Cargo (LOLA 8 spots)	24		X	69,795
Holding Area Munitions Storage	24		X	25,300
Battery Maintenance	24		X	880
Engine Maintenance Addition	24		X	1,100
Wing Headquarters	24		X	41,800
Parking Apron	24		X	628,135
ComSec space	24		X	1,540
Billeting Visitors Quarters	24		X	33,141
AGE Storage Area	24		X	9,900
Flightline Security Fence	24		X	129,932
Apron re-stripe	24		X	N/A
School, Dependent Elementary	24		X	35,200
Fitness Center	24		X	16,500
Squadron Operations	48		X	24,200
Ejection Seat Maintenance	48		X	3,410
Flightline Maintenance	48		X	16,500
Hangar Upgrades	48	X		NA
Academic Training Center (3 Squadrons)	72		X	92,400
Squadron Operations/AMU	72		X	46,200
Operational Training Facility	72		X	13,662
Alternate Mission Equip (AME) shop	72		X	42,900
Dormitory	72		X	83,600
Storage Igloos	72		X	7,260
Squadron Operations	72		X	24,200
Child Development Center	72		X	27,223
Electrical Infrastructure	72		X	1 EA
Interim moves and relocations	24, 48, 72	X	X	23,100
Billeting Visitors Quarters	96		X	33,141
Squadron Operations/AMU	96		X	46,970
Parking Apron	120		X	628,135
Pad, Dangerous Cargo	120		X	34,900
Hangar Upgrades	120	X		NA
Squadron Operations/AMU	120		X	46,970
Family Housing (375 homes)	120		X	907,500
Dormitory	120		X	83,600
Billeting Visitors Quarters	120		X	33,141
Academic Training Center (2 Squadrons)	96, 120		X	61,000
Interim moves and relocations	96, 120	X	X	23,100
Bulk Fuel Storage	72, 96, 120		X	143,748
Total for Scenario H1 (24 Aircraft)				**1,876,303**
Total for Scenario H2 (48 Aircraft)				**1,920,413**
Total for Scenario H3 (72 Aircraft)				**2,401,606**
Total for Scenario H4 (96 Aircraft)				**2,542,717**
Total for Scenario H5 (120 Aircraft)				**4,300,063**

[1] Construction for aircraft scenarios is additive, i.e., construction required for 72 aircraft includes all proposed construction under 24, 48, and 72 aircraft.

[2] Total disturbed area is estimated to be 10 percent larger than the footprint of the finished facility as a best engineering estimate to account for disturbance by construction activities, including laydown areas and utility connections.

HO 2.1.3 Personnel Changes

Beddown of the F-35A training mission would also require basing and appropriately skilled personnel sufficient to operate and maintain the wing and provide necessary support services. Each aircraft scenario has a different manpower requirement. Table HO 2.1–4 shows the change in personnel and dependents under each F-35A aircraft scenario.

Table HO 2.1–4. Holloman AFB F-35A Training Mission Personnel Changes

F-35A Scenario (No. of Aircraft)	*F-16 Mission Personnel*[1]	*Other Base Personnel*	*F-35A Personnel*	*F-35A Contractors*	*F-35A Students*[2]	*Total Base Personnel*	*Net Change in Personnel*	*Depen-dents*[3]	*Total Base Population*	*Net Change*
Baseline Conditions	1,068	5,664	–	–	–	6,732	N/A	6,141	12,873	N/A
Scenario H1W (24)	1,068	5,664	647	50	30	7,459	727	7,674	15,133	2,260
Scenario H2W (48)	1,068	5,664	1,157	50	60	7,999	1,267	8,796	16,795	3,922
Scenario H3W (72)	1,068	5,664	1,668	50	90	8,540	1,808	9,921	18,461	5,588
Scenario H1 (24)	–	5,664	647	50	30	6,391	(341)	5,325	11,716	(1,157)
Scenario H2 (48)	–	5,664	1,157	50	60	6,931	199	6,447	13,378	505
Scenario H3 (72)	–	5,664	1,668	50	90	7,472	740	7,571	15,043	2,170
Scenario H4 (96)	–	5,664	2,178	50	120	8,012	1,280	8,693	16,705	3,832
Scenario H5 (120)	–	5,664	2,688	50	150	8,552	1,820	9,815	18,367	5,494

[1] F-16 mission personnel only—does not include personnel from other tenant units.
[2] The Air Force assumes the F-35A students would be unaccompanied by dependents.
[3] The Air Force assumes 2.2 dependents per military member.
Note: (Number) denotes a negative number. No changes proposed to personnel associated with the German Air Force, RPAs, or other tenant organizations.

HO 2.2 Holloman AFB: Airspace and Ranges

The Air Force expects that the F-35A would operate in the airspace associated with White Sands Missile Range (WSMR), as well as ranges located at Fort Bliss. Training airspace in the vicinity of Cannon AFB would also be utilized. All F-35A flight training activities would take place in existing airspace; therefore, no airspace modifications would be required.

HO 2.2.1 Airspace and Auxiliary Airfield Use

Airspace

A ***sortie-operation*** is the use of one airspace unit by one aircraft.

Figure HO 2.2–1 shows the primary and occasional use airspace units and Military Training Routes (MTRs) that the F-35A would use for flight training. Each of the Military Operations Areas (MOAs) listed has an overlying Air Traffic Control Assigned Airspace (ATCAA) to provide the higher altitudes needed for flight maneuvers above the MOA ceilings. The Talon MOAs and Beak MOAs are owned by the 49 WG at Holloman AFB. The Pecos MOAs are owned and scheduled by the 27th Special Operations Wing at Cannon AFB. In addition to those ATCAAs overlying the MOAs, several others have been established (Ancho, Valmont, and Cowboy) that provide greater vertical and lateral airspace for conducting higher altitude training activities. These ATCAAs are scheduled and managed by the Albuquerque Air Route Traffic Control Center (ARTCC).

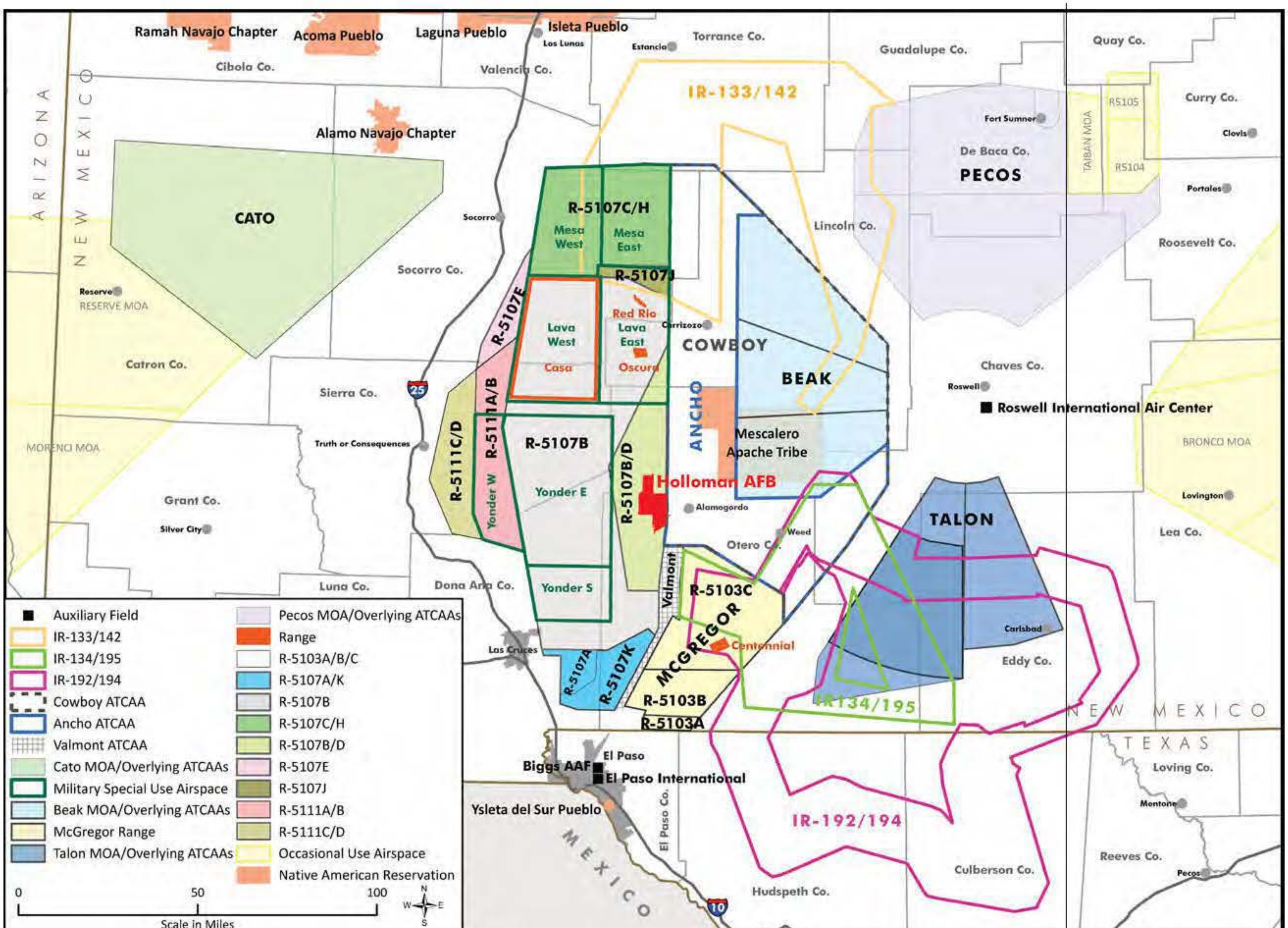


Figure HO 2.2–1. Airspace and Ranges for the F-35A Beddown at Holloman AFB, New Mexico

Restricted Area airspace overlie the air-to-ground ranges at WSMR and Fort Bliss. These Restricted Areas are owned and scheduled by each respective agency. Cooperative scheduling of this airspace by the 49 WG, Fort Bliss, WSMR, and the ARTCC has ensured the needs of all airspace users are accommodated. In addition to the F-16s, Tornadoes, and other aircraft based at Holloman AFB, daily users of these airspace units include the various test missions at WSMR and various Air Force and Army units. Table HO 2.2–1 shows sortie-operations in the primary use airspace units under Scenarios H1W, H2W, and H3W, and Table HO 2.2–2 shows airspace utilization under Scenarios H1 through H5. Note that certain airspace units (i.e., Cato MOA and Pecos MOA) are used by F-35A aircraft under Scenarios H1W, H2W, and H3W, but are not used by F-35A aircraft under Scenario H1, H2, H3, H4, or H5.

Table HO 2.2–1. Projected F-35A Airspace Use at Holloman AFB Under Scenarios H1W, H2W, and H3W

Special Use Airspace	*Supersonic Authorized?*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	*Projected Annual F-35A Sortie-Operations*		
				Scenario H1W (24 Aircraft)	**Scenario H2W (48 Aircraft)**	**Scenario H3W (72 Aircraft)**
MOAs/ATCAAs						
Beak A/B/C MOA/ Overlying ATCAA(s)	Yes, in the overlying Cowboy ATCAA above FL230	F-35A	0	982	1,946	2,945
		F-16	2,217	2,217	2,217	2,217
		Other Military	3,513	3,513	3,513	3,513
		Total	**5,730**	**6,712**	**7,676**	**8,675**
Pecos MOA/ Overlying ATCAA(s)	Yes, at or above 10,000 feet MSL	F-35A	0	219	439	658
		F-16	0	0	0	0
		Other Military	1,673	1,673	1,673	1,673
		Total	**1,673**	**1,892**	**2,112**	**2,331**
Cato MOA/ Overlying ATCAA(s)	Yes, at or above FL300; Functional Check Flight only	F-35A	0	133	265	398
		F-16	0	0	0	0
		Other Military	388	388	388	388
		Total	**388**	**521**	**653**	**786**
Talon MOA/ Overlying ATCAA(s)	No	F-35A	0	642	1,285	1,927
		F-16	969	969	969	969
		Other Military	1,527	1,527	1,527	1,527
		Total	**2,496**	**3,138**	**3,781**	**4,423**
Restricted Areas						
R-5107 (Red Rio-WSMR)	Yes, at or above 10,000 feet MSL	F-35A	0	446	891	1,337
		F-16	1,194	1,194	1,194	1,194
		Other Military	1,327	1,327	1,327	1,327
		Total	**2,521**	**2,967**	**3,412**	**3,858**
R-5107 (Oscura-WSMR)	Yes, at or above 10,000 feet MSL	F-35A	0	446	891	1,337
		F-16	712	712	712	712
		Other Military	1,592	1,592	1,592	1,592
		Total	**2,304**	**2,750**	**3,195**	**3,641**

Special Use Airspace	*Supersonic Authorized?*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	*Projected Annual F-35A Sortie-Operations*		
				Scenario H1W (24 Aircraft)	**Scenario H2W (48 Aircraft)**	**Scenario H3W (72 Aircraft)**
R-5107 (Lava E/W-WSMR)	Yes, at or above 10,000 feet MSL	F-35A	0	1,035	2,070	3,105
		F-16	743	743	743	743
		Other Military	5,320	5,320	5,320	5,320
		Total	**6,063**	**7,098**	**8,133**	**9,168**
R-5107 (Mesa L/H-WSMR)	Yes, at or above 10,000 feet MSL	F-35A	0	529	1,059	1,588
		F-16	885	885	885	885
		Other Military	5,275	5,275	5,275	5,275
		Total	**6,160**	**6,689**	**7,219**	**7,748**
R-5107 (Yonder-WSMR)	Yes, at or above 10,000 feet MSL	F-35A	0	630	1,260	1,889
		F-16	2,265	2,265	2,265	2,265
		Other Military	4,882	4,882	4,882	4,882
		Total	**7,147**	**7,777**	**8,407**	**9,036**
R-5103 (Centennial Range-Fort Bliss)	Yes, at or above 10,000 feet MSL	F-35A	0	446	891	1,337
		F-16	1,207	1,207	1,207	1,207
		Other Military	4,817	4,817	4,817	4,817
		Total	**6,024**	**6,470**	**6,915**	**7,361**
R-5103 (McGregor-Fort Bliss)	Yes, at or above 10,000 feet MSL	F-35A	0	730	1,460	2,191
		F-16	427	427	427	427
		Other Military	19,902	19,902	19,902	19,902
		Total	**20,329**	**21,059**	**21,789**	**22,520**

Key: MSL=mean sea level.

Table HO 2.2–2. Projected F-35A Airspace Use at Holloman AFB Under Scenarios H1, H2, H3, H4, and H5

Special Use Airspace	*Supersonic Authorized?*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	*Projected F-35A Annual Sortie-Operations*				
				Scenario H1 (24 Aircraft)	**Scenario H2 (48 Aircraft)**	**Scenario H3 (72 Aircraft)**	**Scenario H4 (96 Aircraft)**	**Scenario H5 (120 Aircraft)**
MOAs/ATCAAs								
Beak A/B/C MOA/ Overlying ATCAA(s)	Yes, in the overlying Cowboy ATCAA above FL230	F-35A	0	941	2,630	2,824	3,765	4,960
		F-16	2,217	0	0	0	0	0
		Other Military	3,513	3,513	3,513	3,513	3,513	3,513
		Total	**5,730**	**4,454**	**6,143**	**6,337**	**7,278**	**8,473**
Pecos MOA/ Overlying ATCAA(s)	Yes, above 10,000 feet MSL	F-35A	0	0	0	0	0	0
		F-16	0	0	0	0	0	0
		Other Military	1,673	1,673	1,673	1,673	1,673	1,673
		Total	**1,673**	**1,673**	**1,673**	**1,673**	**1,673**	**1,673**
Cato MOA/ Overlying ATCAA(s)	Yes, above FL300; Functional Check Flight only	F-35A	0	0	0	0	0	0
		F-16	0	0	0	0	0	0
		Other Military	388	388	388	388	388	388
		Total	**388**	**388**	**388**	**388**	**388**	**388**

Special Use Airspace	*Supersonic Authorized?*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	***Projected F-35A Annual Sortie-Operations***				
				Scenario H1 (24 Aircraft)	**Scenario H2 (48 Aircraft)**	**Scenario H3 (72 Aircraft)**	**Scenario H4 (96 Aircraft)**	**Scenario H5 (120 Aircraft)**
Talon MOA/ Overlying ATCAA(s)	No	F-35A	0	507	1,241	1,520	2,026	2,533
		F-16	969	0	0	0	0	0
		Other Military	1,527	1,527	1,527	1,527	1,527	1,527
		Total	**2,496**	**2,034**	**2,768**	**3,047**	**3,553**	**4,060**
Restricted Areas								
R-5107 (Red Rio-WSMR)	Yes, above 10,000 feet MSL	F-35A	0	279	808	836	1,114	2,229
		F-16	1,194	0	0	0	0	0
		Other Military	1,327	1,327	1,327	1,327	1,327	1,327
		Total	**2,521**	**1,606**	**2,135**	**2,163**	**2,441**	**3,556**
R-5107 (Oscura-WSMR)	Yes, above 10,000 feet MSL	F-35A	0	279	808	836	1,114	2,229
		F-16	712	0	0	0	0	0
		Other Military	1,592	1,592	1,592	1,592	1,592	1,592
		Total	**2,304**	**1,871**	**2,400**	**2,428**	**2,706**	**3,821**
R-5107 (Lava E/W-WSMR)	Yes, above 10,000 feet MSL	F-35A	0	1,069	2,768	3,206	4,275	5,850
		F-16	743	0	0	0	0	0
		Other Military	5,320	5,320	5,320	5,320	5,320	5,320
		Total	**6,063**	**6,389**	**8,088**	**8,526**	**9,595**	**11,170**
R-5107 (Mesa L/H-WSMR)	Yes, above 10,000 feet MSL	F-35A	0	482	1,086	1,446	1,928	2,917
		F-16	885	0	0	0	0	0
		Other Military	5,275	5,275	5,275	5,275	5,275	5,275
		Total	**6,160**	**5,757**	**6,361**	**6,721**	**7,203**	**8,192**
R-5107 (Yonder-WSMR)	Yes, above 10,000 feet MSL	F-35A	0	644	1,412	1,932	2,577	4,234
		F-16	2,265	0	0	0	0	0
		Other Military	4,882	4,882	4,882	4,882	4,882	4,882
		Total	**7,147**	**5,526**	**6,294**	**6,814**	**7,459**	**9,116**
R-5103 (Centennial Range-Fort Bliss)	Yes, at or above 10,000 feet MSL	F-35A	0	279	808	836	1,114	2,229
		F-16	1,207	0	0	0	0	0
		Other Military	4,817	4,817	4,817	4,817	4,817	4,817
		Total	**6,024**	**5,096**	**5,625**	**5,653**	**5,931**	**7,046**
R-5103 (McGregor-Fort Bliss)	Yes, at or above 10,000 feet MSL	F-35A	0	747	1,922	2,241	2,989	3,989
		F-16	427	0	0	0	0	0
		Other Military	19,902	19,902	19,902	19,902	19,902	19,902
		Total	**20,329**	**20,649**	**21,824**	**22,143**	**22,891**	**23,891**

In addition to MOAs, ATCAAs, and Restricted Areas, low-level MTRs would be used in F-35A training events. Table HO 2.2–3 shows the frequency of operations on primary use MTRs under all F-35A aircraft scenarios.

Table HO 2.2–3. Projected F-35A MTR Use at Holloman AFB Under all F-35A Scenarios

MTR	*Min/Max Altitudes*	*Min/Max Width*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	*Projected Annual F-35A Sortie-Operations*				
					Scenarios H1W and H1 (24 Aircraft)	**Scenarios H2W and H2 (48 Aircraft)**	**Scenarios H3W and H3 (72 Aircraft)**	**Scenario H4 (96 Aircraft)**	**Scenario H5 (120 Aircraft)**
Scenario H1W, H2W, or H3W									
IR-133/ 142	100 feet AGL– 12,000 feet MSL	4 NM – described by latitude/ longitude	F-35A	0	85	170	256	N/A	N/A
			F-16	86	86	86	86	N/A	N/A
			Other Military	523	523	523	523	N/A	N/A
			Total	**609**	**694**	**779**	**865**	**N/A**	**N/A**
IR-134/ 195	100 feet AGL– 12,500 feet MSL	2–12 NM – described by latitude/ longitude	F-35A	0	23	46	68	N/A	N/A
			F-16	86	86	86	86	N/A	N/A
			Other Military	140	140	140	140	N/A	N/A
			Total	**226**	**249**	**272**	**294**	**N/A**	**N/A**
IR-192/ 194	500 feet AGL– 50,000 feet MSL	4–20 NM	F-35A	0	61	122	182	N/A	N/A
			F-16	86	86	86	86	N/A	N/A
			Other Military	373	373	373	373	N/A	N/A
			Total	**459**	**520**	**581**	**641**	**N/A**	**N/A**
Scenario H1, H2, H3, H4, or H5									
IR-133/ 142	100 feet AGL– 12,000 feet MSL	4 NM – described by latitude/ longitude	F-35A	0	85	170	256	341	426
			F-16	86	0	0	0	0	0
			Other Military	523	523	523	523	523	523
			Total	**609**	**608**	**693**	**779**	**864**	**949**
IR-134/ 195	100 feet AGL– 12,500 feet MSL	2-12 NM – Described by latitude/ longitude	F-35A	0	23	46	68	91	114
			F-16	86	0	0	0	0	0
			Other Military	140	140	140	140	140	140
			Total	**226**	**163**	**186**	**208**	**231**	**254**
IR-192/ 194	500 feet AGL– 50,000 feet MSL	4–20 NM	F-35A	0	61	122	182	243	304
			F-16	86	0	0	0	0	0
			Other Military	373	373	373	373	373	373
			Total	**459**	**434**	**495**	**555**	**616**	**677**

Note: F-35A training flights are limited to a minimum altitude of 500 feet above ground level.

The F-35A would operate at higher altitudes more often than legacy aircraft due to its advanced sensors and targeting capabilities. Approximately 85 percent of the training events in the F-35A training syllabus would be conducted at altitudes higher than 10,000 feet above ground level (AGL) (see Table HO 2.2–4).

Table HO 2.2–4. Representative F-16 and F-35A Altitude Use

Altitude (feet)	Percentage of Flight Hours	
	F-16	F-35A
> 30,000 MSL	1	6
18,000–30,000 MSL	3	34
10,000 AGL–18,000 MSL	40	45
5,000–10,000 AGL	26	8
2,000–5,000 AGL	13	4
500–2,000 AGL	14	3
100–500 AGL	3	0

Several training events in the F-35A syllabus could potentially use supersonic speeds. Supersonic operations would be conducted in authorized airspace and would be dictated by the altitudes authorized for each individual airspace unit. Supersonic flight is authorized in Pecos MOA/overlying ATCAAs and in R-5107 and R-5103 at altitudes higher than 10,000 feet mean sea level (MSL). In the ATCAA above Cato MOA, supersonic operations are permitted at altitudes greater than 30,000 feet MSL.

Auxiliary Airfields

The Biggs Army Airfield (Biggs AAF), El Paso International Airport (EPIA), and Roswell International Air Center (RIAC) are identified as regional airfields that may allow their use as auxiliary airfields to support training for F-35A aircraft based at Holloman AFB. Table HO 2.2–5 shows the number of airfield operations under baseline conditions and the number of airfield operations projected at the three airfields under each beddown scenario.

Biggs AAF. Biggs AAF is located north of EPIA on Fort Bliss. It was constructed beginning in 1942 by the U.S. Army (Army) to serve as a bomber and transient air base. The runway is the tenth largest runway in the United States at 13,572 feet long and, as such, can support the largest aircraft in the military's inventory. In 1947, Biggs AAF was transferred to the Air Force and used to train pilots on aircraft such as the B-36, B-47, and B-52. In 1966, the Air Force returned the airfield to the Army. Air Force aircraft are still occasionally supported by Biggs AAF during joint operations such as Operation Roving Sands. Currently, the airfield supports Army as well as several military transient aircraft. On occasion, Biggs AAF also provides support to the Boeing 747 transporting the space shuttle back to the Kennedy Space Center in Florida. Biggs AAF is currently undergoing major mission changes and reconfiguration to support a Combat Aviation Brigade (CAB). Operations listed in Table HO 2.2–5 reflect the beddown of the CAB.

EPIA. EPIA is located 6 miles east of downtown El Paso and is one of the largest airports in the region supporting west Texas and eastern New Mexico. The airport was originally established as a small municipal airport in 1928. It supports commercial and general aviation. Six commercial airlines provide service: American Airlines, Continental Airlines, Delta, Southwest, United, and U.S. Airways. The airport also supports a training center for the National Aeronautics and Space Administration, and astronauts use the runways to practice landing simulated shuttle aircraft. The airport has two runways that support the heavier commercial aircraft, which are 12,010 feet long and 9,025 feet long. The third runway supports general aviation and is 5,493 feet long.

Table HO 2.2–5. Baseline and Projected Annual Auxiliary Airfield Operations at Biggs AAF, EPIA, and RIAC

Aircraft Type	*Baseline Annual Airfield Operations*	*Projected Annual F-35A Airfield Operations*				
		Scenarios H1W/H1 (24 Aircraft)	**Scenarios H2W/H2 (48 Aircraft)**	**Scenarios H3W/H3 (72 Aircraft)**	**Scenario H4 (96 Aircraft)**	**Scenario H5 (120 Aircraft)**
Biggs AAF (All F-35A Aircraft Scenarios)						
F-35A	0	3,884	7,768	11,652	15,536	19,420
F-16	0	0	0	0	0	0
Other Military Aircraft	126,301	126,301	126,301	126,301	126,301	126,301
Total	**126,301**	**130,185**	**134,069**	**137,953**	**141,837**	**145,721**
EPIA (All F-35A Aircraft Scenarios)						
F-35A	0	2,871	5,742	8,613	11,484	14,355
F-16	0	0	0	0	0	0
Other Military Aircraft	817	817	817	817	817	817
Civilian Aircraft	108,373	108,373	108,373	108,373	108,373	108,373
Total	**109,190**	**112,061**	**114,932**	**117,803**	**120,674**	**123,545**
RIAC						
Scenario H1W, H2W, or H3W						
F-35A	0	3,208	6,416	9,624	N/A	N/A
F-16	8,960	8,960	8,960	8,960	N/A	N/A
Other Military Aircraft	36,056	36,056	36,056	36,056	N/A	N/A
Civilian Aircraft	24,716	24,716	24,716	24,716	N/A	N/A
Total	**69,732**	**72,940**	**76,148**	**79,356**	**N/A**	**N/A**
Scenario H1, H2, H3, H4, or H5						
F-35A	0	3,208	6,416	9,624	12,832	16,040
F-16	8,960	0	0	0	0	0
Other Military Aircraft	36,056	36,056	36,056	36,056	36,056	36,056
Civilian Aircraft	24,716	24,716	24,716	24,716	24,716	24,716
Total	**69,732**	**63,980**	**67,188**	**70,396**	**73,604**	**76,812**

RIAC. RIAC is located approximately 5 miles south of the Roswell business district. It was originally constructed as Roswell Army Airfield in 1941 and then transferred to the Air Force and renamed Walker AFB. Walker AFB focused on training bomber pilots, particularly for delivery of atomic weapons. Aircraft as large as the B-36 and the B-29 were stationed at Walker AFB. To support these large aircraft, the runways were constructed to particularly great lengths and are capable of supporting heavy aircraft. The primary runway is 13,000 feet (2.5 miles) long, while the other two runways are 10,000 feet and 7,415 feet long. Walker AFB was deactivated and the airfield returned to the City of Roswell in 1967. As recently as 1989, RIAC has supported B-52 aircraft during a temporary beddown. RIAC currently supports commercial and general aviation. American Eagle serves as the commercial airline. Great Southwest Aviation provides fixed-base operator services, such as fuel and minor maintenance.

With runways capable of supporting heavy aircraft, Boeing has also used RIAC on occasion for testing its commercial aircraft.

HO 2.2.2 Ranges, Ordnance, and Defensive Countermeasures

WSMR is located on the western edge of Holloman AFB and is primarily owned and operated by the U.S. Army. Several ranges are managed by Holloman AFB, including Red Rio, Oscura, and Centennial Range. Red Rio includes approximately 250 tactical targets approved for laser and tactical strafe operations. This range is approved for delivery of both inert and live ordnance up to 2,000 pounds, although the number of live drops is limited to 600 per year. Oscura Range includes a weapons impact scoring system, but is limited to inert ordnance only. Yonder is a subunit of R-5107B within WSMR in which aerial gunnery is permitted using towed targets.

Centennial Range is located within McGregor Range on the Fort Bliss Military Range Complex adjacent to Holloman AFB. Centennial Range has over 250 tactical targets, including a Military Operations in Urban Terrain (MOUT) facility, and authorizes inert ordnance deliveries up to 2,000 pounds. The range is also approved for laser and tactical strafe operations. To support the F-16 FTU, Oscura Range and Centennial Range will be upgraded to Class A manned ranges following range improvements described in the *Recapitalization of the 49th WG Combat Capabilities and Capacities, Holloman Air Force Base, New Mexico Environmental Assessment* (Air Force 2011a), completed in July 2011.

Chapter 2, Table 2–10, lists the type and number of munitions to be used by 24 PAA F-35A aircraft while fulfilling the syllabus requirements for the training mission. Table HO 2.2–6 lists the same munitions prorated by the number of F-35A aircraft under each scenario at Holloman AFB. Because Red Rio Range is authorized for live and inert weapons, Oscura Range is authorized for small inert weapons, and Centennial Range is authorized for inert weapons, the F-35A training missions could be conducted within WSMR and the R-5103C airspace without requiring the F-35A students to transit to a remote range for weapons training. As a training mission, live weapon drops would be infrequent, with only one training event per syllabus requiring live weapons.

The F-35A would also train with Mobile Jettison Unit (MJU)-61/B training flares, which are described in detail in Chapter 2, Section 2.4.5. The MJU-61/B training flare is similar to the M-206 and MJU-7/B flares currently used by the F-16 and the MJU-10/B flares used by the F-22. The F-35A flares would be released in the same airspace authorized for flare use by the F-16. These airspace units include the Restricted Areas in WSMR and within McGregor Range. Flares are also authorized for use in the Beak MOAs/ATCAAs and the Talon MOAs/ATCAAs. The standard minimum release altitude for flares is 2,000 feet AGL. This minimum altitude is regularly adjusted by the managing agencies of the airspace, depending on high or extreme fire danger. Holloman AFB restricts flare use during high or extreme fire danger.

Table HO 2.2–6. Projected F-35A Annual Munitions Use

Munitions Type	*Projected Annual F-35A Usage* Scenarios H1W/H1 (24 Aircraft)	Scenarios H2W/H2 (48 Aircraft)	Scenarios H3W/H3 (72 Aircraft)	Scenario H4 (96 Aircraft)	Scenario H5 (120 Aircraft)	*Range Permitted*
GBU-12 (live)	36	72	108	144	180	Red Rio Range only
GBU-12 (inert)	78	156	234	312	390	Red Rio and Centennial Ranges only
GBU-31 (inert)	20	40	60	80	100	Red Rio and Centennial Ranges only
GBU-32 (inert)	26	52	78	104	130	Red Rio and Centennial Ranges only
25-millimeter Target Practice (TP)	52,000	104,000	156,000	208,000	260,000	All Ranges
MJU-61/B Training Flare	26,400	52,800	79,200	105,600	132,000	Authorized Airspace

Key: GBU=Guided Bomb Unit.

HO 2.2.3 Public Hearings and Agency Concerns

The Air Force conducted public hearings on the Draft EIS in communities in the immediate vicinity of Holloman AFB, as well as in the vicinity of potential airspace and auxiliary airfields. Hearings were held during the week of February 7, 2012, and the public comment period extended through March 14, 2012. There were a total of 135 attendees who signed in at the public hearings. During the public hearings, people were given the opportunity to provide oral and/or written comments on the F-35A Training Basing Draft EIS. Some of the comments and questions are summarized below in Table HO 2.2–7, along with the location in the EIS where the comment is addressed.

Table HO 2.2–7. Issues and Questions Identified During Draft EIS Public Review

Issues and Questions	*Section in EIS or Comment Response Where Issue Is Addressed* Boise AGS	Holloman AFB	Luke AFB	Tucson AGS
Do we need the F-35A?	1.1; 1.3	1.1; 1.3	1.1; 1.3	1.1; 1.3
How does the F-35A noise compare with that of other military aircraft?	3.2; BO 3.2.1	3.2; HO 3.2.1	3.2; LU 3.2.1	3.2; TU 3.2.1
How do the different F-35A alternatives and scenario impacts compare?	BO 3.1.2 through BO 3.15.2; Response NP-13	HO 3.1.2 through HO 3.15.2; Response NP-13	LU 3.1.2 through LU 3.15.2; Response NP-13	TU 3.1.2 through TU 3.15.2; Response NP-13
What is No Action?	2.5	2.5	2.5	2.5
Explain noise measures in the EIS.	3.2; Appendix B	3.2; Appendix B	3.2; Appendix B	3.2; Appendix B

Issues and Questions	***Section in EIS or Comment Response Where Issue Is Addressed***			
	Boise AGS	**Holloman AFB**	**Luke AFB**	**Tucson AGS**
What are the F-35A impacts on property values or property tax revenues?	3.9.2; BO 3.11.1.2; Appendix B.2.7; Response SO-13	3.9.2; HO 3.11.1.2; Appendix B.2.7; Response SO-13	3.9.2; LU 3.11.1.2; Appendix B.2.7; Response SO-13, SO-31	3.9.2; TU 3.11.1.2; Appendix B.2.7; Response SO-13
Could residents lose their homes or businesses as a result of F-35A noise?	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26
Test flyovers of communities are needed for a community survey before an EIS can be prepared.	Response SO-7, NP-13	Response SO-7, NP-13	Response SO-7, NP-13	Response SO-7, NP-13
Would the Air Force regulate flight altitudes, training times, takeoffs and landings, or institute other mitigations to reduce noise impacts?	Response NP-33	Response NP-33	Response NP-33	Response NP-33
Will schools be retrofitted or closed due to noise impacts?	2.8.3; Response SO-32, SO-37		2.8.3; Response SO-32, SO-37	2.8.3; Response SO-32, SO-37
How would the basing of the F-35A mission affect Arizona State land use laws regarding property near a military airport?			LU 3.2.1; LU 3.2.2; LU 3.10.1; LU 3.10.2	TU 3.10.3.1
Can the F-35A train in local airspace?	2.2.1; BO 2.2	2.2.1; HO 2.2	2.2.1; LU 2.2	2.2.1; TU 2.2
What sonic booms are associated with the F-35A?	BO 3.2.2	HO 3.2.2	LU 3.2.2	TU 3.2.2
What would the impact on recreational areas under the airspace be?	BO 3.10.2.1; BO 3.10.2.2	HO 3.10.2.1; HO 3.10.2.2	LU 3.10.2.1; LU 3.10.2.2	TU 3.10.2.1; TU 3.10.2.2
What low-level overflights would occur?	BO 2.2.1; BO 3.1.2	HO 2.2.1; HO 3.1.2	LU 2.2.1; LU 3.1.2	TU 2.2.1; TU 3.1.2
What would the impact on communities under the airspace be?	BO 3.10.1; BO 3.10.2; BO 3.11.1; BO 3.11.2; Response SO-6, SO-45	HO 3.2.2; HO 3.10.1; HO 3.10.2; HO 3.11.1; HO 3.11.2; Response SO-6, SO-20, SO-45	LU 3.10.1; LU 3.10.2; LU 3.11.1; LU 3.11.2; Response SO-6, SO-45	TU 3.10.1; TU 3.10.2; TU 3.11.1; TU 3.11.2; Response SO-6, SO-45
How do we make damage claims for noise impacts?	BO 2.8.4	HO 2.8.4	LU 2.8.4	TU 2.8.4
What would the air quality emissions and air pollution effects be?	BO 3.3	HO 3.3	LU 3.3	TU 3.3
How will F-35As use Davis-Monthan AFB?				2.3.4; TU 3.1.1.1; TU 3.4.1.2
What are the safety risks from pilot error or mechanical malfunction?	BO 3.4.1; BO 3.4.2	HO 3.4.1; HO 3.4.2	LU 3.4.1; LU 3.4.2	TU 3.4.1; TU 3.4.2
How are pilots trained for such a sophisticated aircraft?	2.4.3	2.4.3	2.4.3	2.4.3
Are there special safety issues associated with a single-seat, single-engine aircraft?	BO 3.4.2.2	HO 3.4.2.2	LU 3.4.2.2	TU 3.4.2.2
What testing would occur before training aircraft beddown and flight over cities?	2.4.3.2	2.4.3.2	2.4.3.2	2.4.3.2

Issues and Questions	*Section in EIS or Comment Response Where Issue Is Addressed*			
	Boise AGS	**Holloman AFB**	**Luke AFB**	**Tucson AGS**
What chaff and flare use would occur with the F-35A?	2.4.5; BO 3.4.2.2	2.4.5; HO 3.4.2.2	2.4.5; LU 3.4.2.2	2.4.5; TU 3.4.2.2
Would the potential for fire increase with the F-35A?	2.4.5; BO 3.4.2.2; Response SO-8	2.4.5; HO 3.4.2.2; Response SO-8	2.4.5; LU 3.4.2.2; Response SO-8	2.4.5; TU 3.4.2.2; Response SO-8
Would jet fuel be dumped?	BO 3.4.2.2	HO 3.4.2.2	LU 3.4.2.2	TU 3.4.2.2
Would soils or water be impacted?	BO 3.5; BO 3.7	HO 3.5; HO 3.7	LU 3.5; LU 3.7	TU 3.5; TU 3.7
What would the impacts on wildlife and sensitive species be?	BO 3.6; BO 3.8; Appendix B.2.6	HO 3.6; HO 3.8; Appendix B.2.6	LU 3.6; LU 3.8; Appendix B.2.6	TU 3.6; TU 3.8; Appendix B.2.6
How would domestic and ranch animals be impacted?	2.8; Appendix B.2.6	2.8; Appendix B.2.6	2.8; Appendix B.2.6	2.8; Appendix B.2.6
What traditional or historic impacts would occur?	BO 3.9.1; BO 3.9.2	HO 3.9.1; HO 3.9.2	LU 3.9.1; LU 3.9.2	TU 3.9.1; TU 3.9.2
Would land use under the airspace be impacted?	BO 3.10.1; BO 3.10.2; BO 3.11.2	HO 3.10.1; HO 3.10.2; HO 3.11.2	LU 3.10.1; LU 3.10.2; LU 3.11.2	TU 3.10.1; TU 3.10.2; TU 3.11.2
How would existing land use statutes be affected?	3.2.2; BO 3.11.2.2	3.2.2	3.2.2; LU 3.2; LU 3.10	3.2.2; TU 3.10.3.1
What would the impacts on the local economy be?	BO 3.10.1.2; BO 3.10.2; BO 3.11.1.2	HO 3.10.1.2; HO 3.10.2; HO 3.11.1.2	LU 3.10.1.2; LU 3.10.2; LU 3.11.1.2	TU 3.10.1.2; TU 3.10.2; TU 3.11.1.2
How many jobs would be associated with the F-35A basing?	BO 3.11.1.2; Response SO-21, SO-25	HO 3.11.1.2; Response SO-21, SO-25	LU 3.11.1.2; Response SO-21, SO-25	TU 3.11.1.2; Response SO-21, SO-25
Would noise impact tourism or the ability to enjoy the natural environment?	BO 3.10.2	HO 3.10.2	LU 3.10.2	TU 3.10.2
Who will pay for the impact on school funding and neighborhoods?	2.8.2	2.8.2	2.8.2	2.8.2
A comprehensive community cost-benefit study is needed.	Response DO-10, SO-13	Response DO-10, SO-13	Response DO-10, SO-13	Response DO-10, SO-13
How would minorities and low-income populations be impacted?	BO 3.12.1; BO 3.12.2	HO 3.12.1; HO 3.12.2	LU 3.12.1; LU 3.12.2	TU 3.12.1; TU 3.12.2
What would the health impacts on children and young adults be?	BO 3.12.2.2; Appendix B.2.5	HO 3.12.2.2; Appendix B.2.5	LU 3.12.2.2; Appendix B.2.5	TU 3.12.2.2; Appendix B.2.5
What would the noise effects on schools or children be?	BO 3.2.1.2; BO 3.12.2.2; Appendix B.2.5	HO 3.2.1.2; HO 3.12.2.2; Appendix B.2.5	LU 3.2.1.2; LU 3.12.2.2; Appendix B.2.5	TU 3.2.1.2; TU 3.12.2.2; Appendix B.2.5

HO 3.0 Holloman AFB Affected Environment/Environmental Consequences

HO 3.1 Airspace Management and Use

HO 3.1.1 Base

HO 3.1.1.1 Base Affected Environment

The airspace resource area definition and analysis methodology, as well as key terms and definitions, are discussed in detail in Chapter 3, Section 3.1. The airspace environment established for Holloman AFB and the surrounding region supports a diverse variety of aircraft types and mission activities. The area immediately surrounding the airfield consists of Class D airspace extending from the airfield surface up to and including 6,600 feet MSL, within a 4.8-statute-mile (SM) radius of the airfield, excluding a 2-SM radius of the Alamogordo-White Sands Regional Airport, located approximately 5 nautical miles (NM) east of the base. The airfield elevation is 4,093 feet MSL. The Holloman control tower is responsible for aircraft operations within this Class D airspace. Airfield operations are served by three intersecting runways: 7/25 is 12,917 feet in length; 16/34 is 12,132 feet in length; and 04/22 is 10,576 feet in length. Instrument approach procedures are established for Runways 16, 22, and 34. This intersecting runway configuration provides the capability for aircraft to operate simultaneously on the different runways as air traffic conditions and air traffic control (ATC) separation standards permit. The published airfield hours of operation for Holloman AFB are 6:00 a.m. to midnight, Monday–Thursday; 6:00 a.m. to 9:00 p.m., Friday; 8:00 a.m. to 4:00 p.m., Saturday; and closed on Sunday and holidays, unless otherwise coordinated.

Airfield operations will vary from year to year as the differing types of aircraft operating at this base and the various test, training, and exercise missions change over time. Because such changes affect current and future operational levels, Table HO 2.1–1 indicates the most representative baseline for comparison with the projected F-35A operations. This baseline includes the full complement of F-16 aircraft, as well as the full complement of the unmanned aircraft system (UAS) mission recently assigned to Holloman AFB, for a total baseline of 102,963 annual airfield operations.

The Federal Aviation Administration (FAA) ARTCC has overall responsibility for the airspace within this region and has delegated terminal Class C airspace surrounding the base to the Holloman AFB Radar Approach Control (RAPCON) facility. The RAPCON is responsible for providing ATC radar services to all air traffic operating within this airspace, to include aircraft arrivals and departures at both Holloman AFB and Alamogordo-White Sands Regional Airport. The Fiscal Year 2009 Air Force Air Traffic Activity Report indicates the RAPCON had 29,294 air traffic operations in FY2009 (Air Force 2010a). The lower annual RAPCON operations do not account for the practice runway activities that are included in the airfield operational numbers.

HO 3.1.1.2 Base Environmental Consequences

Table HO 2.1–1 compares the Holloman AFB baseline airfield operations with the projected F-35A operations under each of the F-35A aircraft scenarios. The beddown of each increment of 24 aircraft under Scenarios H1W, H2W, and H3W would increase airfield operations from 15 to 44 percent. Airfield operations under Scenarios H1 through H3 would result in up to 30 percent less than baseline levels. Airfield operations would then progressively increase above baseline levels under Scenarios H4 and H5 from 14 to 29 percent. Holloman AFB has experienced higher levels of airfield operations in the past that were accommodated within the existing Class C and D airspace and the ATC system capabilities established to manage and control air traffic within this airspace. Increased airfield operations would have minimal effects on the airspace configuration, air traffic patterns, instrument procedures, and other air traffic considerations currently established to support the mixture of flight test and training operations at this location. Any modifications that may be required to accommodate F-35A performance characteristics and increased operations would be assessed and coordinated through standard airspace and air traffic management processes so as to ensure the safe and effective management of this airspace environment. No significant changes to the current air traffic patterns, instrument procedures, or ATC services would be required to accommodate the projected F-35A training activities.

HO 3.1.2 Airspace

HO 3.1.2.1 Airspace Affected Environment

Special Use Airspace and Military Training Routes

The SUA currently used by Holloman aircraft for flight training activities includes the MOAs, ATCAAs, and Restricted Areas shown in Figure HO 2.2–1 and described in Table HO 3.1–1. These areas are scheduled to be used individually or combined, as needed, to provide the lateral and vertical airspace required to support aircraft tactics and flight maneuvers. Data are not always maintained for ATCAAs; therefore, unless otherwise available, ATCAA use is assumed to be the same as the associated underlying MOAs since most aircraft maneuvers extend into both MOA/ATCAA altitudes.

Several Restricted Areas are established in this region, providing extensive range capabilities for various test and training activities. The WSMR-controlled airspace includes the specific R-5107 subdivisions shown in Figure HO 2.2–1 that are projected for F-35A air-to-ground training missions. Fort Bliss controls R-5103 A/B/C and the McGregor Range located within this Restricted Area, as well as R-5107A and K (Doña Ana Range Complex). The 49th Wing (49 WG) operates the Casa, Oscura, and Red Rio Ranges located within the WSMR Restricted Areas (R-5107) and the Centennial Range within R-5103. These ranges and Restricted Areas are used by both the Air Force and the Army. Albuquerque ARTCC is the responsible controlling agency for all MOAs, ATCAAs, and Restricted Areas in this region, with the exception of R-5107B, which is controlled by WSMR on a continuous basis. Scheduled use of these areas is coordinated between the 49 WG, Fort Bliss, and WSMR to meet the respective test and training requirements of each organization.

Table HO 3.1–1. Description of Primary Use Airspace for Projected F-35A Use

Airspace	*Airspace Type*	*Airspace Floor*	*Airspace Ceiling*	*Airspace Published Use Time (local)*	*Managed by*
Beak A/B/C	MOA with overlying ATCAAs	12,500 feet MSL	FL290	0600–1800[1]	49 FW
Pecos North High[2]	MOA with overlying Sumner ATCAA	11,000 feet MSL	FL500	0800–2000[1]	27 SOW
Pecos North Low[2]	MOA	500 feet AGL	Up to, but not including, 11,000 feet MSL	0800–2000[1]	27 SOW
Pecos South[2]	MOA with overlying Sumner ATCAA	500 feet AGL	FL500	0800–2000[1]	27 SOW
Cato[2]	MOA with overlying ATCAA	13,500 feet MSL	FL290	0800–2200[1]	150 TFG
Talon High East/West	MOA with overlying ATCAA	500 feet AGL	FL290	Sunrise–Sunset[1]	49 FW
Talon Low	MOA	300 feet AGL	Up to, but not including, 12,500 feet MSL	Sunrise–Sunset[1]	49 FW
R-5107 B (Red Rio)	Restricted airspace	Surface	Unlimited	Continuous	WSMR
R-5107 B (Oscura-WSMR)	Restricted airspace	Surface	Unlimited	Continuous	WSMR
R-5107 B/D (Lava E/W)	Restricted airspace	Surface	Unlimited	Continuous	WSMR
R-5107 C and H (Mesa L/H)	Restricted airspace	Surface	Unlimited	Continuous (R-5107H by NOTAM 12 hours in advance)	WSMR
R-5107 B (Yonder)	Restricted airspace	Surface	Unlimited	Continuous	WSMR
R-5103 (Centennial Range)	Restricted airspace	Surface	Unlimited	0700–2000[1]	Fort Bliss
R-5103 A/B/C (McGregor)	Restricted airspace	Surface	Unlimited (R-5103A up to, but not including, FL180)	0700–2000[1]	Fort Bliss
IR-133/142	Reversed direction MTRs	100 feet AGL	12,000 feet MSL	0700–2300[1]	49 FW
IR-134/195	Reversed direction MTRs	100 feet AGL	12,500 feet MSL	Sunrise to 0600Z	49 FW
IR-192/194	Reversed direction MTRs	100 feet AGL	12,500 feet MSL	Sunrise to 0600Z	49 FW

[1] Monday through Friday; other times by NOTAM [Notice to Airmen].
[2] Pecos MOA/overlying ATCAA and Cato MOA/overlying ATCAA would only be used for F-35A sortie-operations under Scenarios H1W, H2W, and H3W.
Key: 150 TFG=150th Fighter Group; SOW=Special Operations Wing.

Entry clearance into, internal control, and exit clearance for WSMR and Fort Bliss Restricted Areas are provided by Cherokee Control when this airspace is scheduled and activated for training activities. Cherokee Control is a Military Radar Unit managed and manned by Air Force air traffic controllers. This positive control over aircraft operations within this airspace and ATC coordination with the Holloman RAPCON and Albuquerque ARTCC ensure separation is maintained from other military and civil air traffic in this region. Most Victor Airways (below Flight Level [FL] 180) and Jet Routes (FL180 and above) in this region are located adjacent to and clear of the SUA boundaries so that Instrument Flight Rule (IFR) air traffic along these routes and SUA operations do not conflict with each other. Two Jet Routes transiting portions of R-5107 F and G (not shown on Figure HO 2.1–1) are normally unavailable for use when this restricted airspace is active Monday–Friday, as stated on aeronautical charts. The vast majority of the aircraft operations within the MOA/ATCAAs and Restricted Areas occur during the timeframes of the Holloman AFB airfield operating hours.

The MTRs used by Holloman AFB aircraft for conducting low-level training and also projected for use by the F-35As are shown in Figure HO 2.2–1 and listed in Table HO 2.2–3 along with the annual use of each. These routes are paired as reverse courses of each other with virtually the same segment widths and altitudes: IR-133/142, IR-134/195, and IR-192/194. These MTRs are used primarily by the Holloman AFB Tornadoes and the F-16 training mission.

Auxiliary Airfields

Potential auxiliary airfields in the area able to support military flight activities include Biggs AAF (62 NM south), EPIA (64 NM south), and RIAC (85 NM east-northeast), as shown in Figure HO 2.2–1. The annual baseline operations and the projected F-35A operations under each beddown scenario for each auxiliary airfield are shown in Table HO 2.2–5. EPIA and RIAC are public airports that support both civil and military aviation activities. The Fort Bliss Biggs AAF, located adjacent to EPIA, is a military airfield with an operating control tower and extensive runway capabilities that can support all aircraft types. All three airfields have the airspace and airfield environment and instrument approach and departure capabilities needed to support F-35A training requirements.

HO 3.1.2.2 Airspace Environmental Consequences

Special Use Airspace and Military Training Routes

Tables HO 2.2–1 and 2.2–2 reflect the estimated number of sortie-operations that would be conducted within each of the MOAs/ATCAAs and Restricted Areas under the different F-35A aircraft scenarios. To support F-35A training, no additional SUA areas or expansion of the existing areas is proposed or necessary. As noted in these tables, the increased use of these SUA areas by the F-35A under Scenario H1, H2, H3, H4, or H5 would occur in the Beak A/B/C MOAs/overlying ATCAAs and Talon MOAs/ATCAAs and those R-5107 subareas that contain the Red Rio and Oscura air-to-ground ranges. It is not anticipated that F-35As would conduct training in the Pecos and Cato MOAs/ATCAAs under Scenarios H1 through H5. The proposed increases of up to 51 percent of the representative baseline sortie-operations currently flown within the existing SUA areas would require continued coordination between Air Force and Army users as the airspace areas are used to support several missions. Existing interservice processes and procedures for scheduling SUA requirements would be used to optimize training

airspace availability, and to prioritize and de-conflict, as needed, those occasions when there may be overlapping mission needs for the same airspace areas. Those ATC systems and practices currently used to maintain separation between military and civil air traffic operations would be able to safely and effectively manage increased operations.

F-35A MTR use with or without the F-16s would amount to an increase of less than one sortie-operation per day based on 243 flying days per year. Scheduling use of MTRs would continue with existing U.S. Department of Defense (DoD) management processes and would not adversely affect use of these routes. Likewise, ATC systems and practices would be used to maintain separation between military and civil air traffic operations.

Supersonic operations are authorized in those areas noted in Table HO 2.2–1, with a waiver required for those areas where these operations are permitted below 30,000 feet MSL. As the waivers are aircraft-specific, a new waiver would be required to assess and approve supersonic operations by F-35A aircraft in these airspace units.

Overall, while internal DoD scheduling challenges would be expected to increase as a result of the proposed F-35A training operations, scheduling processes are currently being implemented to improve coordination of airspace scheduling, and ATC systems would continue to provide a safe training environment and to maintain separation from civil air traffic operations. As no new airspace units are proposed and no existing airspace units would be expanded under any beddown scenario, impacts of the proposed F-35A training on civil air operations in the region would be expected to be minimal.

Auxiliary Airfields

Use of the auxiliary airfields for F-35A training activities would increase the overall use of these airfields, as shown by the estimates in Table HO 2.2–5. As noted in this table, annual airfield operations at Biggs AAF and EPIA would increase from about 3 percent up to 15 percent under Scenarios H1 through H5. Airfield operations at RIAC would increase up to about 15 percent under Scenario H3W and up to about 10 percent under Scenario H5. The increased use of these airfields by F-35As would have minimal effects on their operations, particularly if training activities at any one location were scheduled around higher-density traffic periods, as necessary.

HO 3.2 Noise

Noise, which is defined simply as unwanted sound, has the potential to affect several environmental resource areas. Comments received during scoping covered a broad range of issues and requested a comprehensive presentation of noise effects. This section will describe noise effects on human annoyance and health, as well as physical effects on structures in the Holloman AFB region of influence (ROI). Noise impacts on biological, land use, socioeconomic, and cultural resources are described briefly in this section and are discussed in more detail in separate sections dealing with those environmental resources. A discussion of the methods used to assess noise impacts throughout this EIS can be found in Chapter 3, Section 3.2. A brief summary of the different measurements used to quantify noise is provided for convenience below.

Different noise measurements (or metrics) quantify noise. These noise metrics are as follows:

- DNL (Day–Night Average Sound Level) combines the levels and durations of noise events, the number of events over a 24-hour period, and more-intrusive nighttime noise to calculate an average noise exposure.
- DNL_{mr} (Onset Rate-Adjusted Day–Night Average Sound Level) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace units, DNL_{mr} is calculated based on the average number of operations per day in the busiest month of the year.
- CDNL (C-Weighted Day–Night Average Sound Level) is a day–night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of single impulsive noises, such as sonic booms.
- L_{max} (Maximum Noise Level) is the highest noise level reached during an event, such as an aircraft overflight.
- SEL (Sound Exposure Level) accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.
- SEL_r (Onset Rate-Adjusted Sound Exposure Level) is the same as SEL but accounts for the onset-rate of a sound which can make a noise seem louder.
- L_{eq} (Equivalent Sound Level) represents aircraft noise levels averaged over a specified time period. The L_{eq} is useful for considering noise effects such as during a school day ($L_{eq(SD)}$; 7:00 a.m. to 4:00 p.m.) or over a single hour ($L_{eq-1hr(SD)}$).

Different metrics measure different impacts. Annoyance represents the most common noise impact. There is a correlation between the percentages of people in a community highly annoyed and the average noise level measured using the DNL metric. Impulsive noise, as measured in CDNL, is annoying to more people than DNL.

HO 3.2.1 Base

HO 3.2.1.1 Base Affected Environment

Holloman AFB supports the operations of several aircraft types, including F-15E, F-4, OH-58D, T-38, Tornado, and various transient aircraft. The beddown of UAS aircraft at Holloman AFB is currently under way, and the beddown of F-16 aircraft is scheduled to occur in the near future. The baseline DNL contours shown in Figure HO 3.2–1 reflect DNL noise levels at Holloman AFB once both beddowns are complete, as calculated using the computer program NOISEMAP.

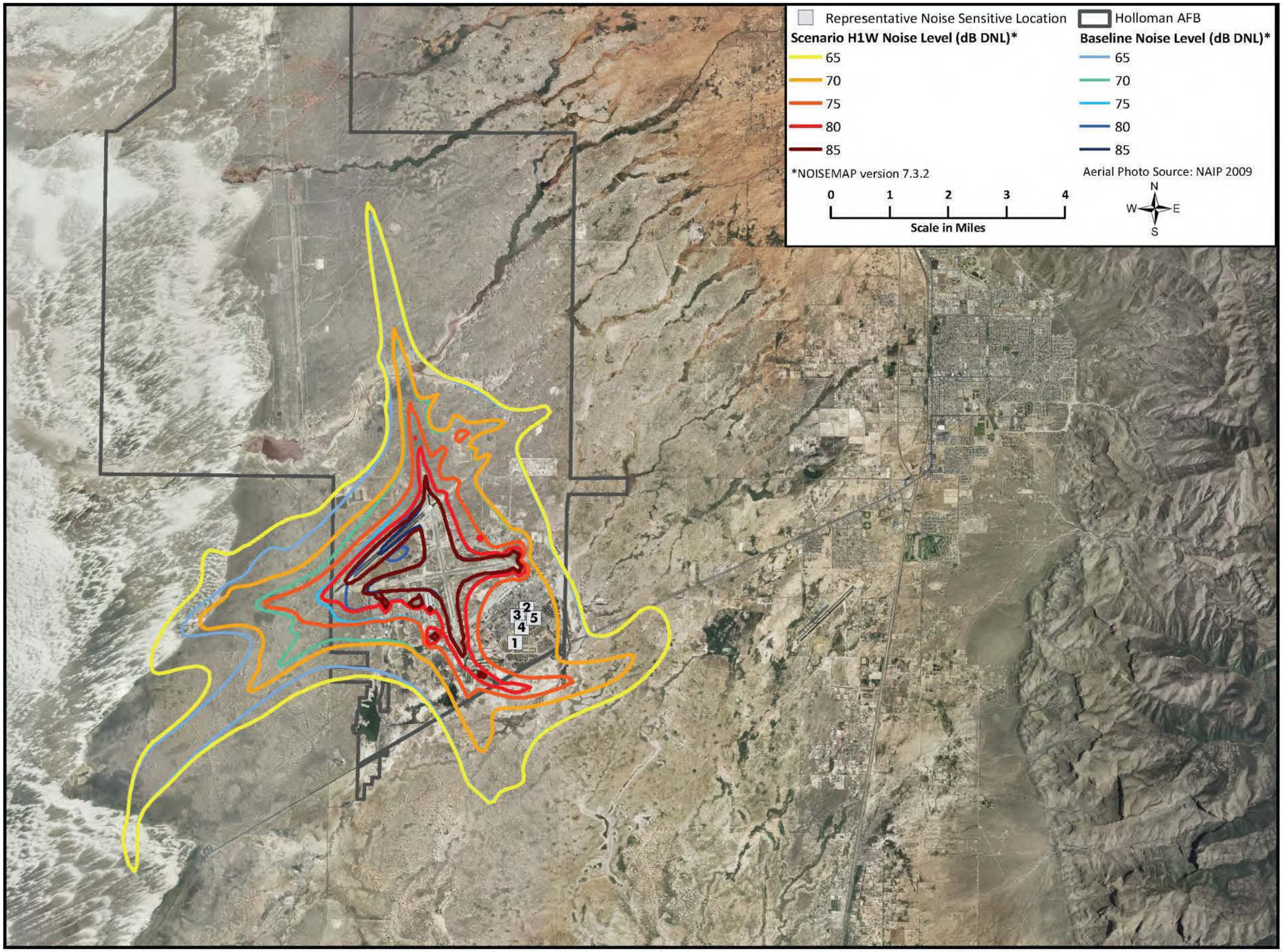


Figure HO 3.2–1. Scenario H1W and Baseline Noise Contours

Approximately 7,307 acres and 49 residents are affected by noise levels exceeding 65 dB DNL in off-base areas (see Section 3.2.1.2, Table HO 3.2–2). Noise levels at several representative noise-sensitive locations under baseline conditions are presented in Section HO 3.2.1.2, Table HO 3.2–3, in terms of the metrics SEL, L_{eq}, and DNL. DNL at these locations is between 72 and 73 dB under baseline conditions. The areas in the vicinity of the representative locations would experience similar aircraft noise levels and noise impacts. Under baseline conditions, the locations studied experience between 13 and 14 overflights per daytime hour, on average, that exceed 50 dB L_{max} indoors (potential for speech interference) when windows are open. When windows are closed, all locations studied experience approximately 12 events per hour exceeding 50 dB L_{max} indoors. The $L_{eq(SD)}$ noise level at the elementary school is 73 dB and that at the middle school is 74 dB. The percentage of persons awakened at least once per night by aircraft noise is 10 to 11 percent at all locations studied if it is assumed that all windows are left open and 6 to 7 percent if it is assumed that all windows are closed.

HO 3.2.1.2 Base Environmental Consequences

Table HO 3.2–1 lists noise levels (SEL) associated with individual F-16C, F-22, F-4C, T-38A, Tornado, and F-35A aircraft overflights at a single location on the ground for purposes of comparison. The locations of aircraft ground tracks, as well as aircraft altitudes, airspeeds, and engine power settings used in this analysis, are representative of F-16, F-22, or projected F-35A operations based on pilot input. Noise levels were generated using NOISEMAP Version 7.3 and the same aircraft operations data used to generate time-averaged noise levels (DNL contours) presented in this section. Note that actual overflight noise levels vary from flight to flight due to variations in aircraft location and configuration, as well as weather conditions and other factors. Under baseline conditions and beddown scenarios, aircraft sometimes fly in groups known as "formations." Since SEL is an exposure-based metric, doubling the number of aircraft flying overhead results in a combined SEL that is 3 dB higher than the individual overflights. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL as listed in Table HO 3.2–1. Holloman AFB Middle School was selected as the reference point location for the analysis because it is near frequently used F-16 and proposed F-35A flight paths. For departure operations, the aircraft generates the highest noise levels when accelerating down the runway and, as a result, Table HO 3.2–1 lists aircraft altitude as zero for departure operations. The noise level (SEL) at Holloman AFB Middle School that would be generated by F-16C afterburner departures would be 1 dB more than that generated by F-35A afterburner departures. The noise level generated by F-35A departures in military power setting would be 2 dB more than that generated by F-16C military power departures. Typical F-35A arrivals would generate an SEL 6 dB higher than that generated by F-16C arrivals. While maneuvering in the traffic pattern as part of a typical closed pattern operation, the F-35A generate an SEL 5 dB higher than a typical F-16C closed pattern operation at the middle school.

Table HO 3.2–1. Projected Noise Levels from Currently Based and F-35A Aircraft at a Specific Location on the Ground

Aircraft	*Operation Type*	*Engine Power*	*Airspeed (knots)*	*Altitude (feet AGL)*	*Slant Distance (feet)*	*SEL (dB)*
F-22 (Military power)	Departure	100% ETR	0	0	5,410	96
F-22 (Afterburner power)		150% ETR	0	0	5,410	93
F-16C Engine F100-PW-220 (Military power)		95% NC	0	0	5,410	88
F-16C Engine F100-PW-220 (Afterburner power)		92% NC	0	0	5,410	93
F-35A (Military power)		100% ETR	0	0	5,410	90
F-35A (Afterburner power)		150% ETR	0	0	5,410	92
F-4C		100% RPM	0	0	5,410	97
T-38A		100% RPM	0	0	5,410	87
Tornado		100% RPM	0	0	5,410	94
F-22	Arrival	26.5% ETR	150	50	6,941	74
F-16C Engine F100-PW-220		80% NC	150	50	6,941	72
F-35A		40% ETR	180	50	6,941	78
Tornado		91% RPM	170	50	6,941	78
F-16C Engine F100-PW-220	Closed Pattern	80% NC	210	1,500	1,590	94
F-35A		55% ETR	215	1,340	1,477	99
F-4C		85% RPM	200	1,999	2,056	97
T-38A		88% RPM	250	2,000	2,056	78
Tornado		86% RPM	200	2,000	2,056	97

Note: Noise levels presented were calculated at Holloman AFB Middle School for the representative departure, arrival, or closed pattern flight that comes closest to the location. Actual individual overflight noise levels vary from the noise levels listed because of variations in aircraft configuration, flight track, altitude, and atmospheric conditions. Representative noise levels were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate noise contours.
Key: ETR=engine thrust request; NC=core engine speed; RPM=revolutions per minute.

Noise impacts under each of the beddown scenarios were modeled using NOISEMAP Version 7.3. Figures HO 3.2–1, HO 3.2–2, and HO 3.2–3 show DNL contours under Scenarios H1W, H2W, and H3W, respectively, overlaid on baseline noise contours. Figures HO 3.2–4, HO 3.2–5, HO 3.2–6, HO 3.2–7, and HO 3.2–8 show DNL contours under Scenarios H1, H2, H3, H4, and H5, respectively. The off-installation area affected by noise levels greater than 65 dB DNL would increase by approximately 1,997 acres, 3,573 acres, and 4,976 acres under Scenarios H1W, H2W, and H3W, respectively (see Table HO 3.2–2). Under Scenario H1, the number of off-installation acres affected by greater than 65 dB DNL would decrease by 834 acres, but under Scenarios H2, H3, H4, and H5, the number of off-installation acres exposed to noise levels greater than 65 dB DNL would increase by 718 acres, 2,131 acres, 3,414 acres, and 4,526 acres, respectively. The total on-installation area affected by noise levels greater than 65 dB DNL would increase by 435 acres, 804 acres, and 1,128 acres under Scenarios H1W, H2W, and H3W, respectively. The on-installation area affected by noise levels greater than 65 dB DNL would decrease under Scenario H1 by 102 acres but would increase under Scenarios H2, H3, H4, and H5 by 317 acres, 658 acres, 989 acres, and 1,359 acres, respectively.

The estimated total number of off-installation residents affected by noise levels greater than 65 dB DNL under Scenarios H1W, H2W, and H3W would change by 1 or fewer persons. The number of on-installation residents affected by noise levels greater than 65 dB DNL would remain the same, but some persons within the 65 dB DNL noise contour would experience slightly higher noise levels. Under Scenarios H1, H2, H3, H4, and H5, the number of off-installation residents affected by noise levels greater than 65 dB DNL would decrease. The total number of on-installation residents affected by noise levels greater than 65 dB DNL would not change, but some residents would experience slightly lower noise levels, as reflected by the shifting of residents from the 70–74 dB DNL noise contour interval to the 65–69 dB DNL noise contour interval. Persons experiencing an increase in noise level would be more likely to become annoyed by the noise, as described in Chapter 3, Table 3–4. The estimates of off-installation residents impacted by elevated noise levels in Table HO 3.2–2 represent the best available data from the 2010 census. Off-installation populations were estimated by proportioning the area of the census blocks affected by noise contours. This method counts permanent residents only, and does not estimate persons residing in hotels and other temporary accommodations. On-installation populations reflect current residential unit occupancy data. The total accompanied housing population was estimated assuming an average of 2.2 dependents per housed military member. The residential population within each noise level increment was estimated by counting residences and then proportioning total accompanied housing population evenly among the structures. The total dormitory population was distributed evenly among dormitory buildings and then dormitory building, within each noise contour interval were counted to yield an estimated number of dormitory residents affected by each noise level increment.

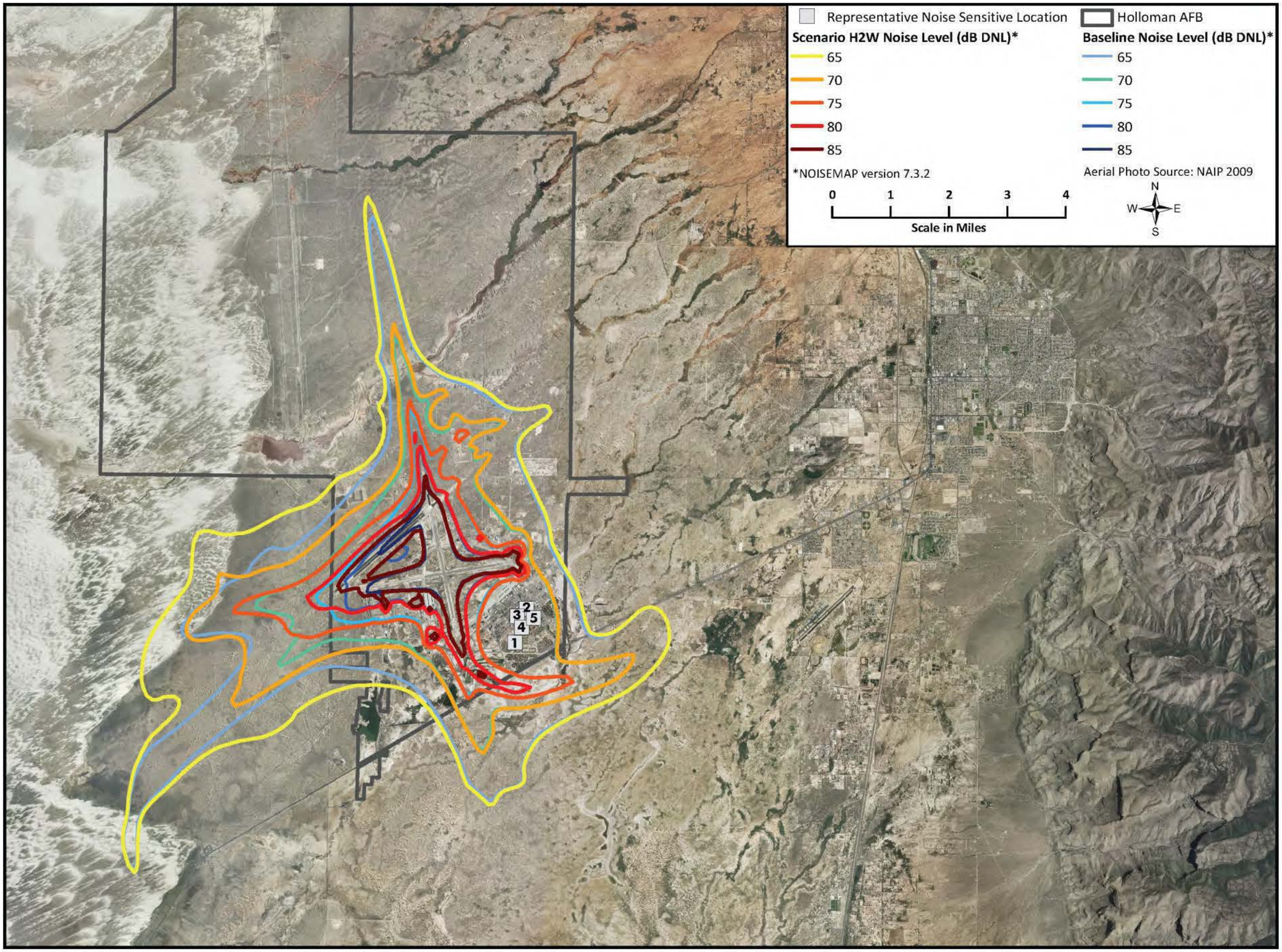


Figure HO 3.2–2. Scenario H2W and Baseline Noise Contours

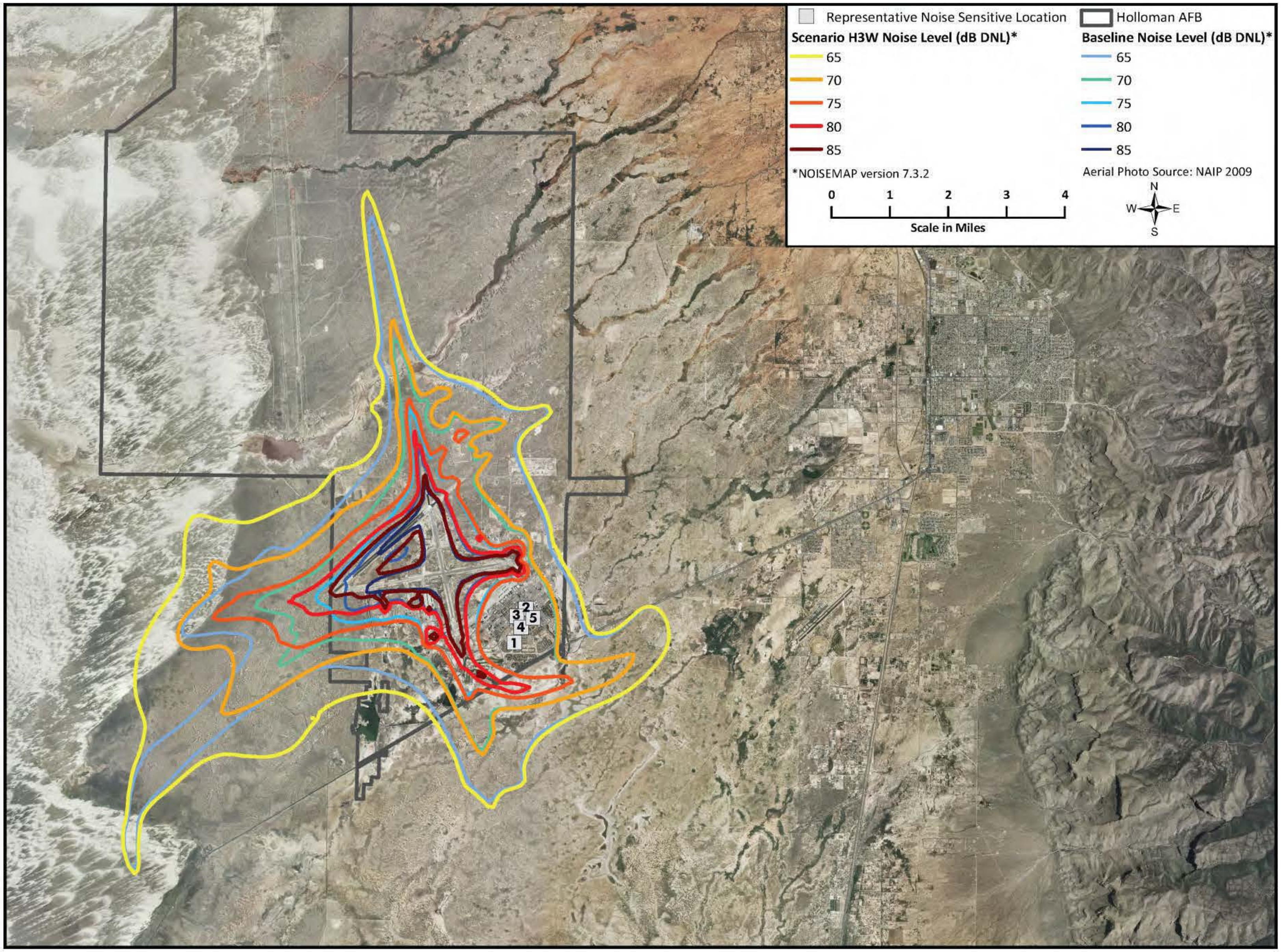


Figure HO 3.2–3. Scenario H3W and Baseline Noise Contours

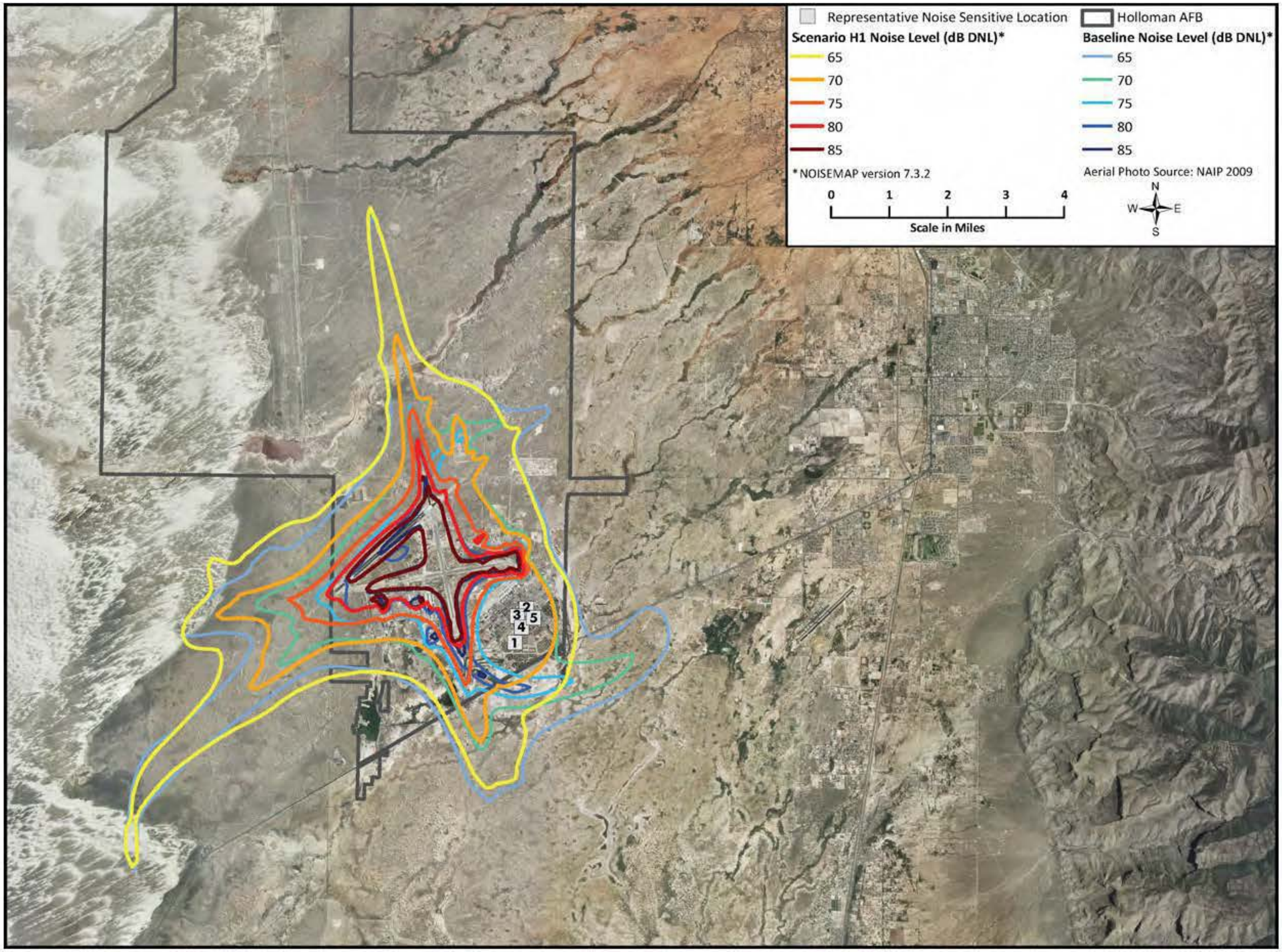


Figure HO 3.2–4. Scenario H1 and Baseline Noise Contours

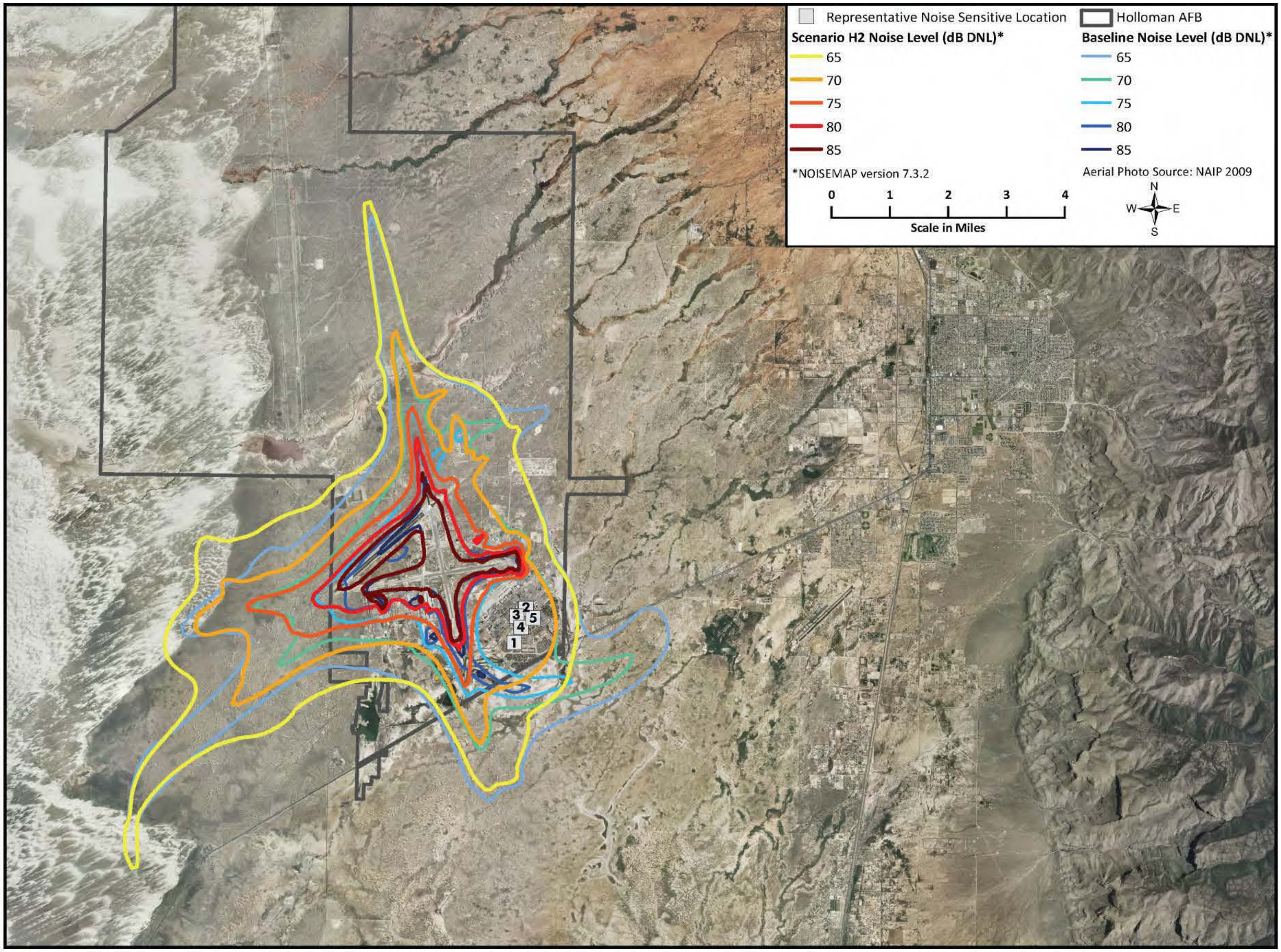


Figure HO 3.2–5. Scenario H2 and Baseline Noise Contours

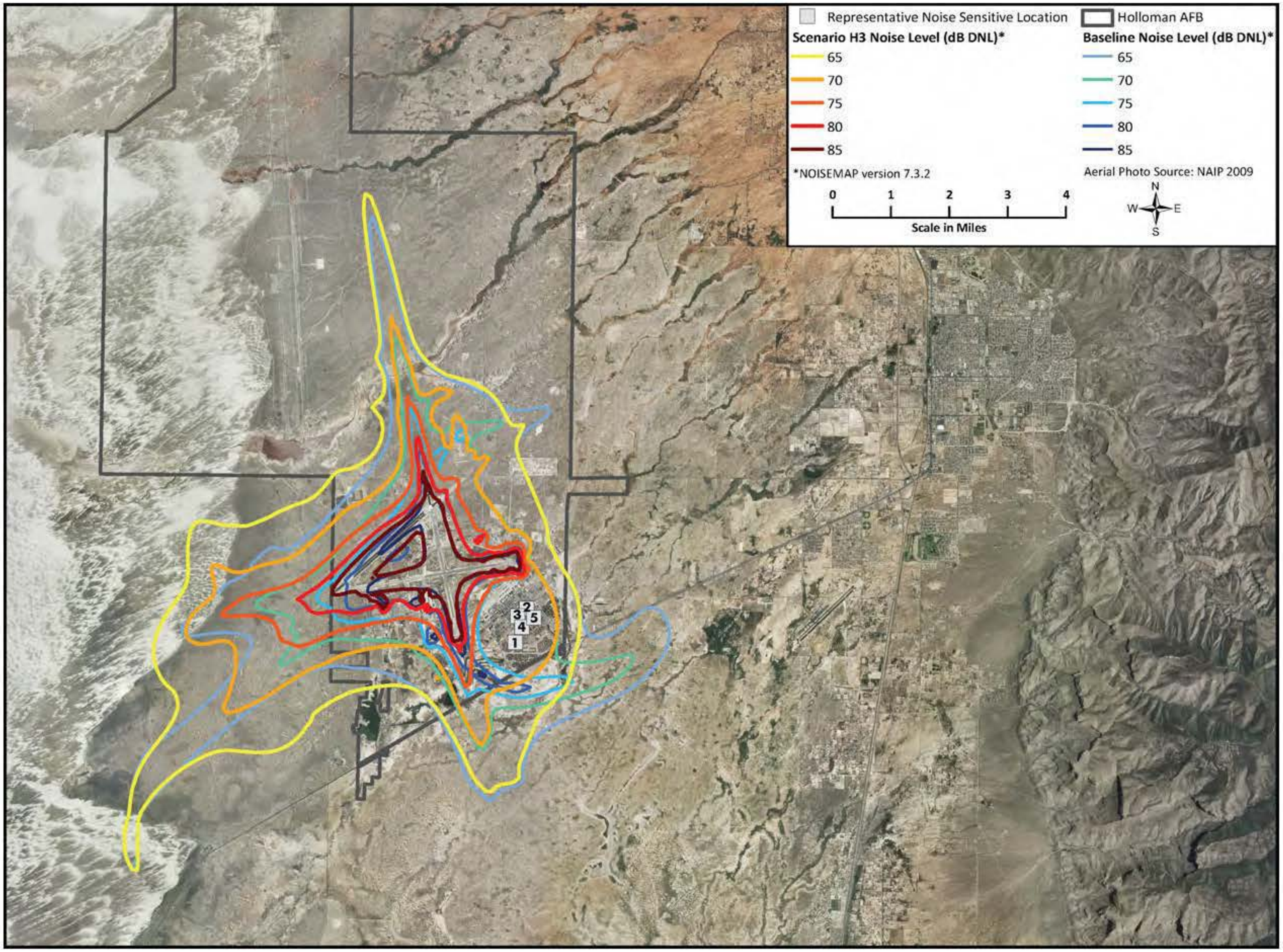


Figure HO 3.2–6. Scenario H3 and Baseline Noise Contours

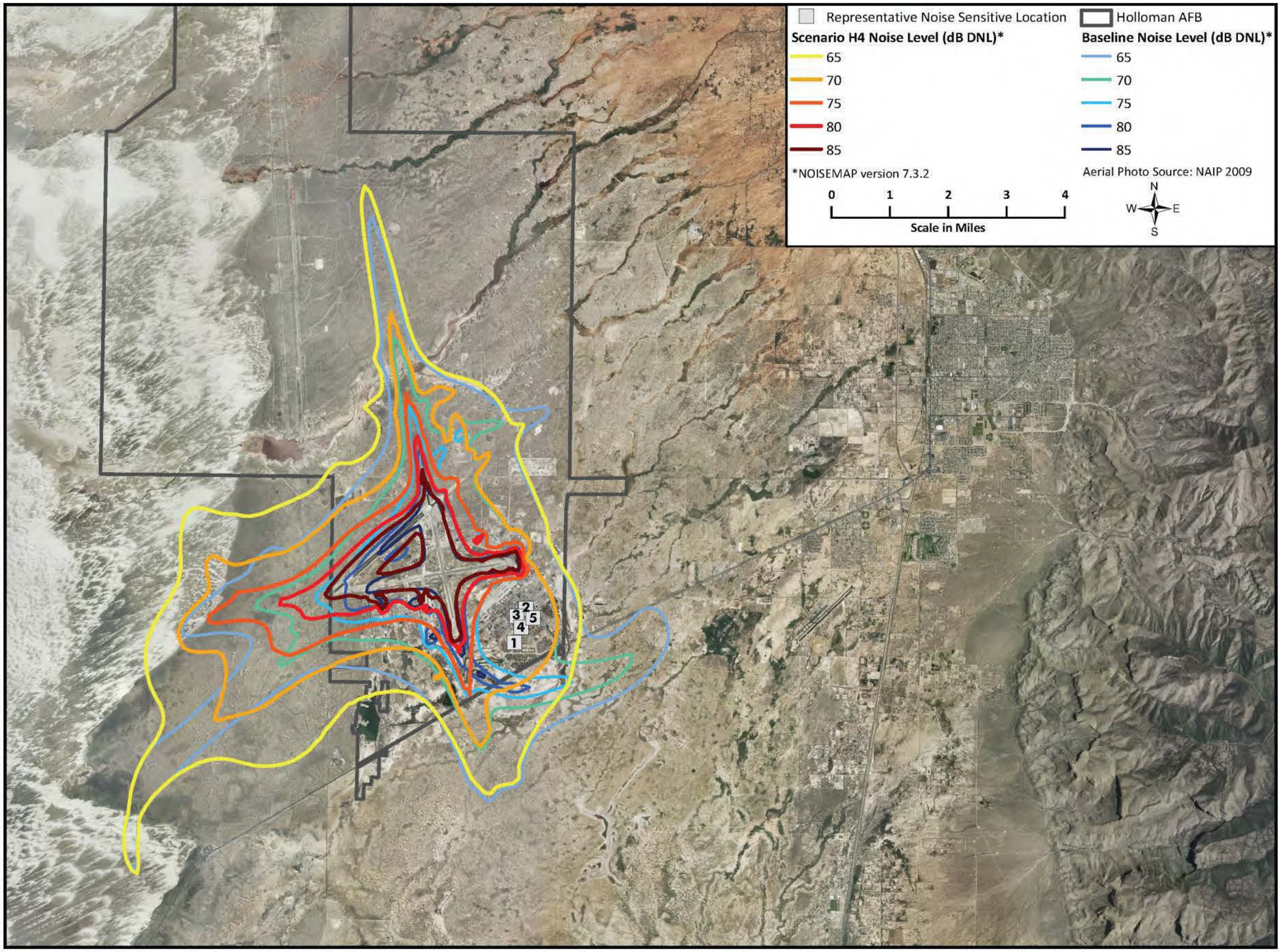


Figure HO 3.2–7. Scenario H4 and Baseline Noise Contours

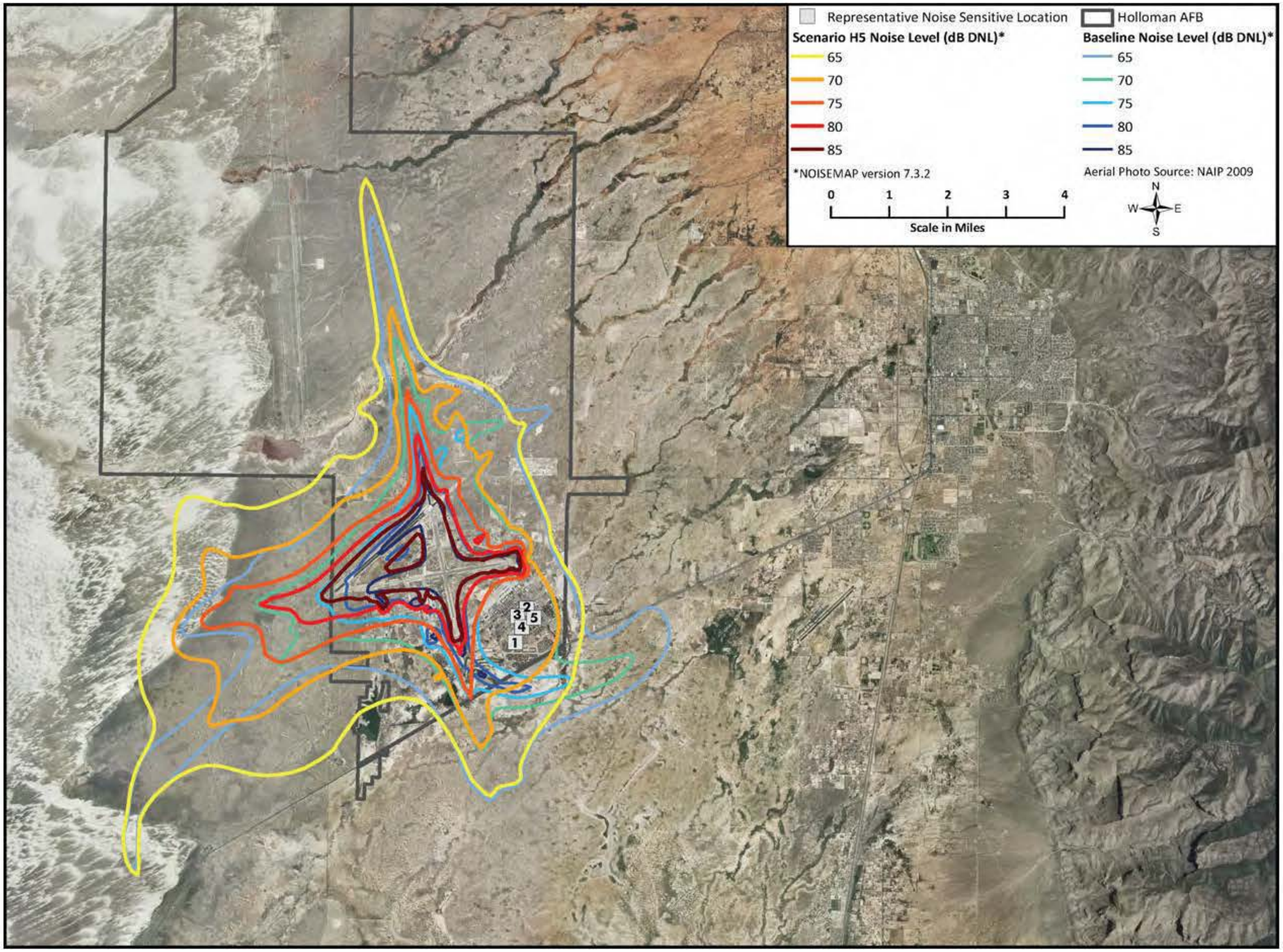


Figure HO 3.2–8. Scenario H5 and Baseline Noise Contours

Table HO 3.2–2. Population and Acreage Under Noise Contours Near Holloman AFB, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation)*		*Population Affected (On-Installation)*		*Total Area Affected (Off-Installation)*		*Total Area Affected (On-Installation)*	
	Number	**Change**	**Number**	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions								
Total ≥ 65	**49**	**N/A**	**3,999**	**N/A**	**7,307**	**N/A**	**11,397**	**N/A**
65–69	22	N/A	383	N/A	5,496	N/A	3,905	N/A
70–74	27	N/A	3,616	N/A	1,532	N/A	3,387	N/A
75–79	0	N/A	0	N/A	240	N/A	1,637	N/A
80–84	0	N/A	0	N/A	39	N/A	1,324	N/A
≥ 85	0	N/A	0	N/A	0	N/A	1,144	N/A
Scenario H1W (24 Aircraft)								
Total ≥ 65	**48**	**(1)**	**3,999**	**0**	**9,304**	**1,997**	**11,832**	**435**
65–69	21	(1)	332	(51)	6,450	954	4,027	122
70–74	27	0	3,667	51	2,261	729	3,465	78
75–79	0	0	0	0	534	294	1,627	(10)
80–84	0	0	0	0	59	20	1,337	13
≥ 85	0	0	0	0	0	0	1,376	232
Scenario H2W (48 Aircraft)								
Total ≥ 65	**48**	**(1)**	**3,999**	**0**	**10,880**	**3,573**	**12,201**	**804**
65–69	21	(1)	276	(107)	7,240	1,744	4,118	213
70–74	27	0	3,723	107	2,709	1,177	3,581	194
75–79	0	0	0	0	805	565	1,675	38
80–84	0	0	0	0	126	87	1,285	(39)
≥ 85	0	0	0	0	0	0	1,542	398
Scenario H3W (72 Aircraft)								
Total ≥ 65	**48**	**(1)**	**3,999**	**0**	**12,283**	**4,976**	**12,525**	**1,128**
65–69	21	(1)	214	(169)	7,953	2,457	4,209	304
70–74	27	0	3,785	169	3,091	1,559	3,676	289
75–79	0	0	31	31	1,028	788	1,717	80
80–84	0	0	0	0	211	172	1,245	(79)
≥ 85	0	0	0	0	0	0	1,678	534
Scenario H1 (24 Aircraft)								
Total ≥ 65	**44**	**(5)**	**3,999**	**0**	**6,473**	**(834)**	**11,295**	**(102)**
65–69	22	0	544	161	4,830	(666)	3,975	70
70–74	22	(5)	3,455	(161)	1,412	(120)	3,541	154
75–79	0	0	0	0	225	(15)	1,365	(272)
80–84	0	0	0	0	6	(33)	1,226	(98)
≥ 85	0	0	0	0	0	0	1,188	44
Scenario H2 (48 Aircraft)								
Total ≥ 65	**44**	**(5)**	**3,999**	**0**	**8,025**	**718**	**11,714**	**317**
65–69	22	0	499	116	5,531	35	4,104	199
70–74	22	(5)	3,500	(116)	1,920	388	3,659	272
75–79	0	0	0	0	512	272	1,408	(229)
80–84	0	0	0	0	62	23	1,192	(132)
≥ 85	0	0	0	0	0	0	1,351	207

Contour Interval (dB DNL)	Population Affected (Off-Installation)		Population Affected (On-Installation)		Total Area Affected (Off-Installation)		Total Area Affected (On-Installation)	
	Number	Change	Number	Change	Acres	Change	Acres	Change
Scenario H3 (72 Aircraft)								
Total ≥ 65	**44**	**(5)**	**3,999**	**0**	**9,438**	**2,131**	**12,055**	**658**
65–69	21	(1)	467	84	6,230	734	4,189	284
70–74	23	(4)	3,532	(84)	2,324	792	3,764	377
75–79	0	0	0	0	746	506	1,459	(178)
80–84	0	0	0	0	138	99	1,121	(203)
≥ 85	0	0	0	0	0	0	1,522	378
Scenario H4 (96 Aircraft)								
Total ≥ 65	**44**	**(5)**	**3,999**	**0**	**10,721**	**3,414**	**12,386**	**989**
65–69	21	(1)	410	27	6,869	1,373	4,291	386
70–74	23	(4)	3,589	(27)	2,679	1,147	3,855	468
75–79	0	0	0	0	939	699	1,511	(126)
80–84	0	0	0	0	227	188	1,095	(229)
≥ 85	0	0	0	0	7	7	1,634	490
Scenario H5 (120 Aircraft)								
Total ≥ 65	**44**	**(5)**	**3,999**	**0**	**11,833**	**4,526**	**12,756**	**1,359**
65–69	20	(2)	339	44	7,395	1,899	4,438	533
70–74	24	(3)	3,660	(44)	3,001	1,469	3,950	563
75–79	0	0	0	0	1,098	858	1,563	(74)
80–84	0	0	0	0	317	278	1,076	(248)
≥ 85	0	0	0	0	22	22	1,729	585

Note: (Number) denotes a negative number.

Table HO 3.2–3 lists noise levels at several representative noise-sensitive locations under baseline conditions and all F-35A beddown scenarios considered at Holloman AFB. Representative locations include all on-installation schools, hospitals, and places of worship. There are no known off-installation schools, hospitals, or places of worship within the 65 dB DNL noise contour line under any scenario; therefore, all locations studied are located on the installation. Descriptions of noise levels at the representative noise-sensitive locations provide information relevant to surrounding land uses. For this reason, all noise metrics were calculated for all locations studied, even though some metrics are not directly relevant to a specific facility listed. For example, the percentage of persons awakened at least once per night is not directly relevant to a school or place of worship, but is relevant to residential areas, which are often located near schools and places of worship.

The White Sands National Monument (WHSA) is located immediately west of Holloman AFB and is overflown frequently during landing and takeoff operations. Aircraft are not permitted to fly within 1,500 feet vertically or 1 NM laterally of the WHSA Visitor Center. This restriction, which would remain in place under F-35A beddown scenarios, was designed in part to reduce risk of structural damage to the visitor center. As the F-35A does not generate noise levels in excess of 130 dB in any 1/3-octave frequency band at distances of less than 250 feet, this existing avoidance area should continue to provide sufficient protection of the visitor center. Although portions of the WHSA are within the 65 dB DNL contour under baseline conditions and several beddown scenarios, the visitor center remains outside of the 65 dB DNL contour under all scenarios.

Table HO 3.2–3. Noise Levels at Representative Noise-Sensitive Locations, Baseline Conditions and F-35A Beddown Scenarios

ID No.	*General Description[1]*	*Outdoor DNL*		*Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]*		*Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]*		*Outdoor $L_{eq(SD)}$*		*Percentage Awakened (windows open)[2]*		*Percentage Awakened (windows closed)[2]*	
Baseline Conditions													
1	Child Development Center (CDC) No. 1	72		13		12		73		10		6	
2	CDC No. 2	73		14		12		74		11		7	
3	Chapel	72		13		12		73		11		6	
4	Elementary School	72		13		12		73		10		6	
5	Middle School	73		13		12		74		11		7	
Scenario H1W (24 Aircraft)													
1	CDC No. 1	72	(0)	15	(2)	14	(2)	73	(0)	10	(0)	6	(0)
2	CDC No. 2	73	(0)	16	(2)	14	(2)	74	(0)	11	(0)	7	(0)
3	Chapel	72	(0)	15	(2)	14	(2)	73	(0)	11	(0)	6	(0)
4	Elementary School	72	(0)	15	(2)	14	(2)	73	(0)	10	(0)	6	(0)
5	Middle School	73	(0)	15	(2)	14	(2)	74	(0)	11	(0)	7	(0)
Scenario H2W (48 Aircraft)													
1	CDC No. 1	72	(0)	18	(5)	16	(4)	74	(1)	10	(0)	6	(0)
2	CDC No. 2	73	(0)	19	(5)	16	(4)	74	(0)	11	(0)	7	(0)
3	Chapel	72	(0)	18	(5)	16	(4)	74	(1)	11	(0)	6	(0)
4	Elementary School	72	(0)	18	(5)	16	(4)	74	(1)	10	(0)	6	(0)
5	Middle School	73	(0)	18	(5)	15	(3)	74	(0)	11	(0)	7	(0)
Scenario H3W (72 Aircraft)													
1	CDC No. 1	72	(0)	20	(7)	18	(6)	74	(1)	10	(0)	6	(0)
2	CDC No. 2	73	(0)	21	(7)	18	(6)	74	(0)	11	(0)	7	(0)
3	Chapel	72	(0)	20	(7)	18	(6)	74	(1)	11	(0)	6	(0)
4	Elementary School	73	(1)	20	(7)	18	(6)	74	(1)	10	(0)	6	(0)
5	Middle School	73	(0)	20	(7)	17	(5)	74	(0)	11	(0)	7	(0)
Scenario H1 (24 Aircraft)													
1	CDC No. 1	71	(1)	9	(4)	8	(4)	73	0	9	(1)	6	0
2	CDC No. 2	72	(1)	10	(4)	8	(4)	73	(1)	10	(1)	6	(1)
3	Chapel	72	0	9	(4)	8	(4)	73	0	10	(1)	6	0
4	Elementary School	72	0	9	(4)	8	(4)	73	0	9	(1)	6	0
5	Middle School	73	0	10	(3)	8	(4)	74	0	10	(1)	6	(1)
Scenario H2 (48 Aircraft)													
1	CDC No. 1	72	0	12	(1)	11	(1)	73	0	9	(1)	6	0
2	CDC No. 2	73	0	13	(1)	11	(1)	74	0	10	(1)	6	(1)
3	Chapel	72	0	12	(1)	11	(1)	73	0	10	(1)	6	0
4	Elementary School	72	0	12	(1)	11	(1)	73	0	10	0	6	0
5	Middle School	73	0	12	(1)	10	(2)	74	0	10	(1)	6	(1)
Scenario H3 (72 Aircraft)													
1	CDC No. 1	72	0	14	1	13	1	73	0	9	(1)	6	0
2	CDC No. 2	73	0	15	1	13	1	74	0	10	(1)	6	(1)
3	Chapel	72	0	14	1	13	1	73	0	10	(1)	6	0
4	Elementary School	72	0	14	1	13	1	73	0	10	0	6	0
5	Middle School	73	0	14	1	11	(1)	74	0	10	(1)	6	(1)

ID No.	General Description[1]	Outdoor DNL		Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]		Outdoor $L_{eq(SD)}$		Percentage Awakened (windows open)[2]		Percentage Awakened (windows closed)[2]	
Scenario H4 (96 Aircraft)													
1	CDC No. 1	72	0	17	4	15	3	73	0	9	(1)	6	0
2	CDC No. 2	73	0	18	4	15	3	74	0	10	(1)	7	0
3	Chapel	72	0	17	4	15	3	73	0	10	(1)	6	0
4	Elementary School	72	0	17	4	15	3	73	0	10	0	6	0
5	Middle School	73	0	17	4	13	1	74	0	10	(1)	6	(1)
Scenario H5 (120 Aircraft)													
1	CDC No. 1	72	0	19	6	17	5	73	0	10	0	6	0
2	CDC No. 2	73	0	20	6	17	5	74	0	10	(1)	7	0
3	Chapel	72	0	19	6	17	5	74	1	10	(1)	6	0
4	Elementary School	72	0	19	6	17	5	74	1	10	0	6	0
5	Middle School	73	0	19	6	15	3	74	0	10	(1)	7	0

[1] Locations presented in this table are provided to help understand the noise environment. This list is not meant to be inclusive of all noise-sensitive receptors in the affected environment. Numbers in parentheses indicate delta relative to baseline conditions.

[2] Structures are assumed to provide 15 dB noise level reduction with windows open and 25 dB noise level reduction with windows closed.

Changes in noise level at the noise-sensitive locations under the beddown scenarios would range from no change to a decrease of 1 dB DNL. To put these changes in perspective, under non-laboratory conditions, a person with normal hearing cannot differentiate changes in instantaneous noise level of less than 3 dB. Under all scenarios, the noise levels at the locations studied would decrease or remain the same.

The average number of aircraft noise events per daytime hour (hours between 7:00 a.m. and 10:00 p.m.) among all locations studied with potential to interfere with indoor speech (interior L_{max} greater than or equal to 50 dB) would increase under Scenario H1W by 15 percent with windows open and by 17 percent with windows closed. Under Scenario H2W, the number of potential speech interference events would increase by 38 percent with windows open and by 32 percent with windows closed. Under Scenario H3W, the number of speech interference events would increase by 53 percent with windows open and by 48 percent with windows closed. Under Scenarios H1 and H2, the number of speech interference events would decrease, but under Scenarios H3, H4, and H5, the number would increase by 8 percent, 30 percent, and 45 percent, respectively, with windows open and by 5 percent, 22 percent, and 38 percent, respectively, with windows closed. Structures are assumed to provide 15 dB noise level reduction with windows open and 25 dB with windows closed. Persons whose communications are interrupted are expected to experience some annoyance, and children in schools could experience disruptions in learning.

The elementary and middle schools located on Holloman AFB (Location Nos. 4 and 5) are exposed to $L_{eq(SD)}$ of greater than 65 dB under baseline conditions and all beddown scenarios. The $L_{eq(SD)}$ at the elementary school would increase by 1 dB under Scenarios H2W, H3W, and H5. Under all other scenarios, the $L_{eq(SD)}$ for both schools would either remain the same or

decrease. F-35A operational schedules are not known at this time. In a hypothetical hour with twice the average daytime number of operations, L_{eq} would be 3 dB higher than the $L_{eq(SD)}$ listed in Table HO 3.2–3. Actual outdoor-to-indoor noise level reduction varies from school to school and between locations within individual schools.

The probability of awakening by aircraft noise was assessed using the methodology contained in American National Standards Institute (ANSI)/Acoustical Society of America (ASA) S12.9-2008/Part 6 (ANSI 2008). Under all scenarios, the average percentage of persons awakened per night by aircraft noise at all locations studied would decrease or remain the same.

F-35A training at active-duty Air Force locations would not be expected to take place on the weekend (i.e., Saturday or Sunday). However, mission requirements would dictate the flying schedule. Other weekend flying and ANG weekend training is expected to continue at its current rate.

The risk of hearing loss under the beddown scenarios was assessed using the methodology described in Chapter 3, Section 3.2, and in greater detail in Appendix B. No off-installation or on-installation residents would be exposed to noise at or greater than 80 dB DNL under any of the scenarios. Under all scenarios, the number of on-installation buildings affected by noise levels greater than 80 dB DNL would decrease. The potential hearing loss risk among workers on Holloman AFB would be managed according to DoD guidelines.

As F-35A noise levels would not exceed 130 dB in any 1/3-octave frequency band at distances of greater than 250 feet, no damage to structures is expected to occur as a result of F-35A subsonic noise (CHABA 1977). The term 'frequency bands' refers to noise energy in a certain range of frequencies and is similar in concept to frequency bands employed on home stereo equalizers to control relative levels of bass and treble. Noise energy in certain frequency bands has increased potential to vibrate and/or damage structures. Furthermore, studies conducted on vibrations induced by subsonic aircraft overflights generating similar noise levels to the F-35A in ancient Anasazi ruins indicate that vibrations would not occur at or near potentially damaging levels. Additional discussion of the effects of noise on cultural resources and ancient fragile structures can be found in Section HO 3.9.

Indirect impacts of noise on land use patterns could potentially occur, although it is impossible to predict exactly what form the impact would take. As discussed in detail in Section HO 3.10, implementation of certain scenarios would result in additional existing land uses becoming incompatible with noise due to the increase in noise level.

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include non-auditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines. More-specific discussions on noise effects on animal species can be found in Sections HO 3.6, HO 3.7, and HO 3.8.

Many factors affect the market value of real property. While qualities of the property itself, surrounding properties, and the local real estate market are clearly the primary determinants of value, ambient noise levels could also play a role in determining market value. The effect of ambient noise level on real property market value has been studied extensively, but results have been contradictory. More-specific discussions on the effect of noise on real property market value can be found in Section HO 3.11.

Any claims from Air Force–related damage would begin by contacting the Holloman AFB Public Affairs Office with details of the claim. The Air Force would then investigate to establish the exact nature and extent of any damage.

HO 3.2.2 Airspace

HO 3.2.2.1 Airspace Affected Environment

Within MOAs, ATCAAs, and Restricted Areas, training flights are typically widely dispersed and random. Flight operations are constrained only by the boundaries of the airspace and any restrictions on training in the form of designated avoidance areas. The Air Force has developed the MOA-Range NOISEMAP (MR_NMAP) program to calculate subsonic aircraft noise in these areas (Lucas and Calamia 1996). MR_NMAP can also calculate noise levels beneath MTRs where flight paths are restricted to a designated corridor. Subsonic aircraft noise levels associated with operations in the primary use airspace were calculated using MR_NMAP and are shown in Table HO 3.2–4. Noise was not explicitly computed for occasional use airspace because of the low amount of use. The number of operations conducted in these occasional use airspace units is so low that their influence on the cumulative noise is negligible. Areas beneath the primary use airspace units experience less than 65 dB DNL_{mr} under baseline conditions.

Each MTR includes several segments with defined beginning and ending locations, as well as a defined route corridor width to the right and to the left of the centerline. Studies of MTR operations show that operations are concentrated near the MTR centerline and spend relatively less time near the route corridor edges (Lucas and Plotkin 1988). MTR noise levels stated in this EIS are for a location beneath the MTR centerline in the narrowest segment of the MTR (i.e., the point of highest concentration of overflights). Pilots often enter and exit MTRs at points along the route rather than at the beginning and end points, such that certain MTR segments may experience fewer annual sortie operations than indicated in Table HO 2.2–2.

Military aircraft are not the only source of sound under the airspace. Aircraft noise must be compared with background or "ambient" noise, as well as evaluated on an absolute basis. Ambient noise levels in a quiet residential setting are approximately 45 dB DNL (EPA 1974). The vast majority of the airspace ROI consists of rural areas in which noise levels would be below 45 dB. In those areas where military aircraft noise levels would be less than 45 dB DNL_{mr}, military aircraft noise could be noticed but would not add appreciably to overall noise levels. Noise levels in such airspace units are simply listed in Table HO 3.2–4 as "< 45."

Sonic boom noise levels were calculated using the BOOMAP program. Under baseline conditions, sonic boom noise levels do not exceed 62 dB CDNL under any primary use airspace unit. The Beak MOAs do not permit supersonic flight operations, but Cowboy ATCAA, which overlies the Beak MOAs and extends horizontally to the west of the Beak MOAs, does permit supersonic operations. The average number of sonic booms experienced on the ground near the

center of each primary airspace unit is 1.8 or fewer per day under baseline conditions. Areas distant from the center of the airspace units receive fewer sonic booms on average. Supersonic flight is also not authorized in Talon MOA or on MTRs.

Table HO 3.2–4. Noise Environment for Holloman AFB Primary Use Airspace, Baseline Conditions and F-35A Beddown Scenarios

Airspace Name[1]	*DNL_{mr}*	*CDNL*	*Booms/Day*
Baseline Conditions			
Beak MOAs and overlying ATCAAs	< 45	49	1.4
Pecos MOA	< 45	46	0.4
Cato MOA	< 45	< 45	0.1
Talon MOA	54	N/A	N/A
R-5107 (Red Rio)	59	48	0.6
R-5107 (Oscura)	57	47	0.5
R-5107 (Lava E/W)	61	52	1.5
R-5107 (Mesa L/H)	63	52	1.5
R-5107 (Yonder)	63	53	1.8
R-5103 (Centennial)	54	47	0.5
R-5103 (McGregor)	56	45	0.3
IR-133/142	55	N/A	N/A
IR-134/195	49	N/A	N/A
IR-192/194	53	N/A	N/A
Scenario H1W (24 Aircraft)			
Beak MOAs and overlying ATCAAs	45	50	1.6
Pecos MOA	46	47	0.4
Cato MOA	< 45	< 45	0.1
Talon MOA	57	N/A	N/A
R-5107 (Red Rio)	63	48	0.6
R-5107 (Oscura)	62	47	0.5
R-5107 (Lava E/W)	63	52	1.6
R-5107 (Mesa L/H)	63	52	1.6
R-5107 (Yonder)	63	53	1.8
R-5103 (Centennial)	58	47	0.5
R-5103 (McGregor)	59	46	0.4
IR-133/142	57	N/A	N/A
IR-134/195	52	N/A	N/A
IR-192/194	56	N/A	N/A
Scenario H2W (48 Aircraft)			
Beak MOAs and overlying ATCAAs	47	50	1.7
Pecos MOA	48	47	0.5
Cato MOA	45	< 45	0.1
Talon MOA	58	N/A	N/A
R-5107 (Red Rio)	65	48	0.6
R-5107 (Oscura)	65	47	0.5
R-5107 (Lava E/W)	64	52	1.6
R-5107 (Mesa L/H)	64	52	1.6
R-5107 (Yonder)	64	53	1.8
R-5103 (Centennial)	60	47	0.5
R-5103 (McGregor)	61	47	0.4
IR-133/142	59	N/A	N/A
IR-134/195	53	N/A	N/A
IR-192/194	57	N/A	N/A

Airspace Name[1]	*DNL_{mr}*	*CDNL*	*Booms/Day*
Scenario H3W (72 Aircraft)			
Beak MOAs and overlying ATCAAs	49	50	1.8
Pecos MOA	49	47	0.5
Cato MOA	46	< 45	0.2
Talon MOA	59	N/A	N/A
R-5107 (Red Rio)	66	48	0.6
R-5107 (Oscura)	66	48	0.5
R-5107 (Lava E/W)	64	53	1.7
R-5107 (Mesa L/H)	64	52	1.6
R-5107 (Yonder)	65	53	1.9
R-5103 (Centennial)	62	47	0.5
R-5103 (McGregor)	62	47	0.5
IR-133/142	60	N/A	N/A
IR-134/195	54	N/A	N/A
IR-192/194	58	N/A	N/A
Scenario H1 (24 Aircraft)			
Beak MOAs and overlying ATCAAs	< 45	46	1.0
Pecos MOA	N/A	N/A	N/A
Cato MOA	N/A	N/A	N/A
Talon MOA	53	N/A	N/A
R-5107 (Red Rio)	61	45	0.3
R-5107 (Oscura)	61	45	0.3
R-5107 (Lava E/W)	62	52	1.4
R-5107 (Mesa L/H)	63	52	1.4
R-5107 (Yonder)	63	51	1.3
R-5103 (Centennial)	56	< 45	0.2
R-5103 (McGregor)	59	45	0.3
IR-133/142	57	N/A	N/A
IR-134/195	52	N/A	N/A
IR-192/194	56	N/A	N/A
Scenario H2 (48 Aircraft)			
Beak MOAs and overlying ATCAAs	47	46	1.2
Pecos MOA	N/A	N/A	N/A
Cato MOA	N/A	N/A	N/A
Talon MOA	55	N/A	N/A
R-5107 (Red Rio)	64	45	0.3
R-5107 (Oscura)	64	46	0.3
R-5107 (Lava E/W)	64	52	1.5
R-5107 (Mesa L/H)	64	52	1.4
R-5107 (Yonder)	64	51	1.3
R-5103 (Centennial)	59	43	0.2
R-5103 (McGregor)	61	46	0.4
IR-133/142	59	N/A	N/A
IR-134/195	53	N/A	N/A
IR-192/194	57	N/A	N/A

Airspace Name[1]	*DNL*$_{mr}$	*CDNL*	*Booms/Day*
Scenario H3 (72 Aircraft)			
Beak MOAs and overlying ATCAAs	48	47	1.3
Pecos MOA	N/A	N/A	N/A
Cato MOA	N/A	N/A	N/A
Talon MOA	56	N/A	N/A
R-5107 (Red Rio)	66	45	0.3
R-5107 (Oscura)	66	46	0.4
R-5107 (Lava E/W)	64	52	1.5
R-5107 (Mesa L/H)	64	52	1.4
R-5107 (Yonder)	65	51	1.3
R-5103 (Centennial)	61	44	0.2
R-5103 (McGregor)	63	46	0.4
IR-133/142	60	N/A	N/A
IR-134/195	54	N/A	N/A
IR-192/194	58	N/A	N/A
Scenario H4 (96 Aircraft)			
Beak MOAs and overlying ATCAAs	50	47	1.5
Pecos MOA	N/A	N/A	N/A
Cato MOA	N/A	N/A	N/A
Talon MOA	57	N/A	N/A
R-5107 (Red Rio)	67	46	0.3
R-5107 (Oscura)	67	46	0.4
R-5107 (Lava E/W)	65	52	1.6
R-5107 (Mesa L/H)	65	52	1.5
R-5107 (Yonder)	65	52	1.4
R-5103 (Centennial)	62	44	0.3
R-5103 (McGregor)	64	47	0.5
IR-133/142	61	N/A	N/A
IR-134/195	55	N/A	N/A
IR-192/194	59	N/A	N/A
Scenario H5 (120 Aircraft)			
Beak MOAs and overlying ATCAAs	51	48	1.6
Pecos MOA	N/A	N/A	N/A
Cato MOA	N/A	N/A	N/A
Talon MOA	58	N/A	N/A
R-5107 (Red Rio)	68	46	0.4
R-5107 (Oscura)	68	46	0.4
R-5107 (Lava E/W)	66	52	1.7
R-5107 (Mesa L/H)	65	52	1.5
R-5107 (Yonder)	66	52	1.4
R-5103 (Centennial)	63	45	0.3
R-5103 (McGregor)	65	48	0.5
IR-133/142	62	N/A	N/A
IR-134/195	56	N/A	N/A
IR-192/194	60	N/A	N/A

HO 3.2.2.2 Airspace Environmental Consequences

Implementation of the F-35A beddown scenarios would result in changes in subsonic noise levels beneath the primary use airspace ranging from a decrease of 1 dB to an increase of 11 dB (see Table HO 3.2–4). To put these changes in perspective, increases in instantaneous noise levels of 3 to 10 dB are typically described as "noticeable," and increases of greater than or equal to 10 dB are typically described as "more than twice as loud." The increases in noise levels are a result of additional sortie-operations being flown in the airspace and the F-35A being somewhat louder than the other aircraft that currently use the airspace. Noise levels beneath Talon MOA would decrease by 1 dB DNL_{mr} under Scenario H1. Noise levels would not exceed 65 dB DNL_{mr} under any airspace unit under Scenarios H1W, H1, or H2. Under Scenarios H2W, H3W, H3, H4, and H5, noise levels would equal or exceed 65 dB DNL_{mr} under 2, 3, 3, 5, and 6 of the airspace units, respectively. Noise levels would not exceed 65 dB DNL_{mr} under any MTR under any of the scenarios. F-35A noise levels at several altitudes are shown, along with noise levels of other representative users of the airspace, in Table HO 3.2–5.

Noise levels generated by overflight of F-35A aircraft and several other aircraft that use the training airspace frequently are shown in Table HO 3.2–5. For each aircraft type, the table shows SEL and, in parentheses, the SEL_r metric which adds a decibel 'penalty' to events with fast onset rates that have an increased potential to surprise people. Under baseline conditions and beddown scenarios, aircraft sometimes fly in groups known as "formations." Since SEL is an exposure-based metric, doubling the number of aircraft flying overhead results in a combined SEL that is 3 dB higher than the individual overflights. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL as listed in Table HO 3.2–5.

Most F-35A training time is spent at high altitudes, with approximately 93 percent of total training time occurring at or above 5,000 AGL (see Chapter 2, Table 2–9). When conducting low-altitude training at high engine power settings, F-35A aircraft overflights generate noise levels exceeding 115 dB SEL. As discussed in Appendix B, Section B.2.5.1, studies suggest that individual noise events in excess of 115 dB have the potential to trigger a temporary shift in hearing threshold, although the findings of the studies conflict as to the extent of the shift and whether the shift is to an increased or decreased hearing sensitivity (Ising et al. 1999; West and Green 1994).

Table HO 3.2–5. Comparative Aircraft SEL_r Under the Flight Track for Aircraft at Various Vertical Distances (Feet AGL) in Training Airspace

Aircraft	SEL (SEL_r) in dB					Power	Speed (knots)
	500 AGL	1,000 AGL	2,000 AGL	5,000 AGL	10,000 AGL		
F-16[1]	116 (118)	111 (111)	104 (104)	94 (94)	86 (86)	104% NC	350
F-35A[2]	127 (128)	120 (120)	112 (112)	102 (102)	94 (94)	95% ETR	475
A-10	97 (97)	91 (91)	83 (83)	67 (67)	55 (55)	5333 NF	325
F-15	116 (121)	110 (111)	104 (104)	95 (95)	85 (85)	82% NC	550
F/A-18C/D	106 (107)	100 (100)	94 (94)	83 (83)	73 (73)	88% NC	400
F-22	124 (126)	119 (119)	113 (113)	104 (104)	95 (95)	100% ETR	300
T-38	115 (115)	109 (109)	101 (101)	89 (89)	78 (78)	100% RPM	299
Tornado	101 (102)	95 (95)	89 (89)	80 (80)	71 (71)	89% RPM	420
H-60	91 (91)	87 (87)	81 (81)	N/A	N/A	LFO Lite 140 Kts	140
F/A-18 E/F	116 (119)	111 (111)	105 (105)	95 (95)	86 (86)	83% N2	350
F-4C	114 (119)	109 (110)	103 (103)	93 (93)	83 (83)	98% RPM	550

[1] The F-16 engine is GE-100.
[2] The noise levels for the F-35A operating at high speeds were based on an empirical curve fit from the noise data contained in the NoiseFile database for these high-speed operations (Wyle 2010).

Note: Level flight, steady high-speed conditions. Used standard acoustical conditions (59 degrees Fahrenheit and 70 percent relative humidity).

Key: ETR=engine thrust request; N2=engine speed at position 2; NC=core engine speed; NF=fan speed; LFO Lite 140 Kts=helicopter in level flight at 140 knots; RPM=revolutions per minute.

Flight data recorded during multiple low-altitude training flight simulator runs were used to estimate the average number of times per month that a location under the MTR centerline would be exposed to noise levels exceeding 115 dB. From the simulator data, it was found that 80 percent of the total time spent on an MTR was spent at aircraft engine power settings of 50 percent ETR or below, with the remainder of the time spent at higher engine power settings. Approximately 70 percent of total time was spent at altitudes between 500 and 750 feet AGL, with the remaining time being spent at altitudes between 750 and 1,500 feet AGL. A probability-based model, which is described in Appendix B, Section B.3, was used to combine data collected from flight simulator runs with expected MTR frequency of use data. On the narrowest segment of the most frequently used MTR under the scenario with the highest number of MTR sortie-operations (i.e., Scenario H5), an average of 8 overflights per year would exceed 115 dB at a particular point underneath the centerline of the MTR. The average frequency of noise levels exceeding 120 dB (the lower threshold for ear discomfort) would be substantially less. Low-altitude noise events are very brief, with the high noise levels typically lasting less than 4 seconds. Noise-induced permanent threshold shifts (NIPTS), otherwise known as hearing loss, typically occurs when loud events are repeated frequently such as occurs in a workplace environment. Infrequent loud events, such as the events that would

occur with proposed F-35A low-altitude training, could be highly annoying, but would not be expected to result in NIPTS.

As mentioned in Section HO 2.1.1, certain F-35A training events are required by the training syllabus to be conducted after sunset. Under scenarios involving the beddown of 48 or more F-35A aircraft at Holloman AFB, it is expected that some of the required night operations in airspace units would unavoidably be conducted during the late-night period between 10:00 p.m. and 7:00 a.m. due to scheduling limitations. A 10 dB noise "penalty" is assigned to noise generated by flying operations during this time period to account for added intrusiveness. Under Scenarios H2/H2W, an estimated 1 percent of total sortie-operations would be conducted after 10:00 p.m. Under Scenarios H3/H3W, H4, and H5, an estimated 3 percent, 6 percent, and 7 percent, respectively, of total F-35A training operations would be conducted after 10:00 p.m. An estimated 1 percent of flying operations are conducted after 10:00 p.m. under baseline conditions, and the time distribution of these non-F-35A flying operations is not expected to change under the beddown scenarios.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training. The amplitude of an individual sonic boom is measured by its peak overpressure, in pounds per square foot, and depends on an aircraft's size, weight, geometry, Mach number, and flight altitude. Table HO 3.2–6 shows sonic boom peak overpressures for direct overflight of F-16C, F-15, F-22, and F-35A at Mach 1.2 in straight and level flight at various altitudes as estimated using the program CABOOM (Carlson 1978). At all reference altitudes, the F-15 and F-22 generate the most intense sonic booms of the four aircraft listed.

Table HO 3.2–6. Sonic Boom Peak Overpressures (pounds per square feet) for Direct Overflight of F-16, F-22, and F-35A Aircraft at Mach 1.2 Level Flight

Aircraft	***Altitude (feet AGL)***		
	10,000	**20,000**	**30,000**
F-16C	4.9	2.5	1.6
F-15	6.4	3.3	2.2
F-22	6.2	3.2	2.1
F-35A	5.4	2.9	1.9

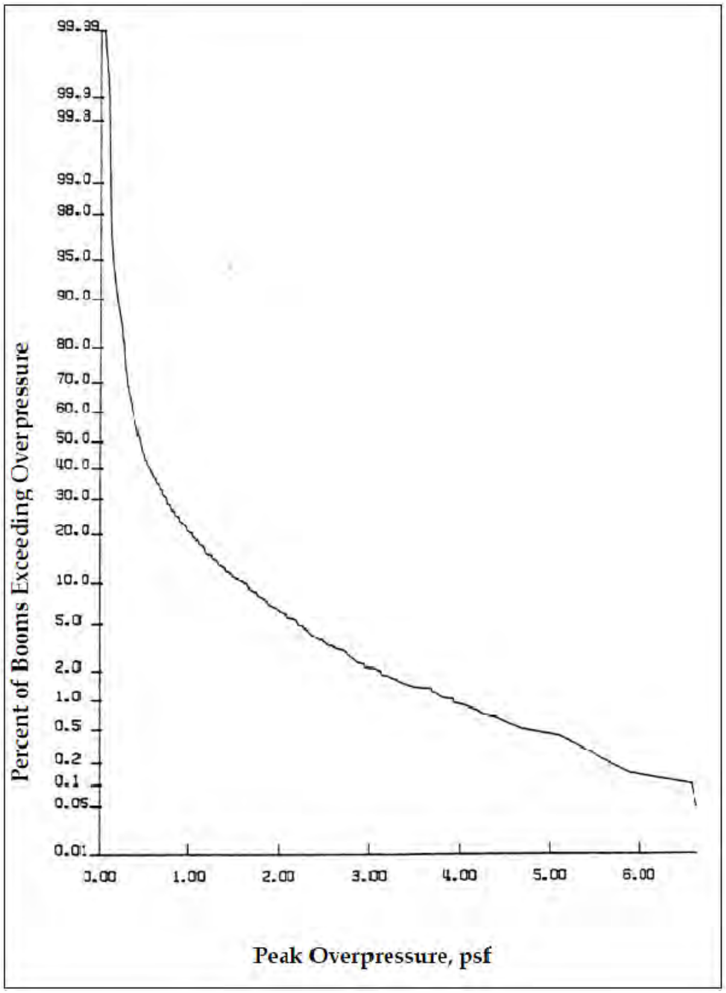
Note: Overpressures presented reflect straight and level flight at constant speed; aircraft maneuvers may generate localized "focus booms" with overpressures of 2 to 5 times the magnitude of the steady state sonic booms (Plotkin 1990).
Source: CABOOM (Carlson 1978).

Sonic boom overpressures associated with this type of supersonic flight decrease as the lateral distance from the aircraft flight path increases. Maneuvers can also affect boom amplitude, increasing or decreasing overpressures relative to those shown in Table HO 3.2–6. Research conducted using the ray acoustic theory computer model PCBOOM indicates that fighter aircraft sonic boom focus factors are generally in the range of 2–3 times that generated by steady state flight, while larger supersonic aircraft may generate focus booms up to 5 times more intense than booms generated by steady state flight (Plotkin 1990).

Focus booms affect very limited ground areas such that the frequency of occurrence of high-intensity focus booms is relatively low. A measurement program was conducted to record the occurrence and intensity of sonic booms near the center of a supersonic training airspace

unit (Plotkin et al. 1990). Simultaneous with the sonic boom measurements, recordings were made of air combat maneuvers conducted by the F-15 aircraft that were generating the sonic booms. Figure HO 3.2–9 shows the relative occurrence of overpressures of various intensities recorded during air combat maneuvers, including focus booms. F-35A supersonic training is expected to be similar to F-15 and F-16 supersonic training in terms of the time spent at supersonic speeds per sortie, the types of maneuvers conducted, and the Mach numbers used during training. Therefore, the relative occurrence of the intense sonic booms would be expected to be similar to those shown in Figure HO 3.2–9. On average, at a given location near the center of a training airspace unit, approximately 1 percent of the sonic booms experienced would be expected to exceed 4 psf and approximately 0.2 percent would be expected to exceed 6 psf based on the results of the study. Study results do not apply to aircraft, such as the F-22, that can reach supersonic airspeeds without using afterburner. The F-22 is unique in its ability to maneuver at supersonic speeds without use of the afterburner. Jets such as the F-35A and F-16 do not have this capability and would not generate as many sonic booms per sortie as the F-22.

Table HO 3.2–4 lists the number of booms expected to occur per day and the CDNL in any given location near the center of the primary airspace units under baseline conditions and all F-35A beddown scenarios. The average number of sonic booms experienced per day would increase slightly under certain scenarios relative to baseline conditions as a result of additional supersonic-capable aircraft bedding down. The CDNL would remain below 62 dB under all scenarios in all airspace units. The addition of F-35A supersonic operations would increase the CDNL by 1 dB or less under Scenario H1W and by 2 dB or less under Scenarios H2W and H3W. The number of sonic booms per day would increase under these scenarios by less than one additional sonic boom per day. The CDNL beneath McGregor Range would increase by between 1 and 3 dB under Scenarios H2, H3, H4, and H5. The CDNL beneath all other airspace units would remain approximately the same or decrease under all beddown scenarios. The average number of sonic booms per day under these scenarios would decrease or remain the same beneath Mesa, Yonder, Oscura, Centennial, and Red Rio Range airspace, but would increase by less than one boom per day beneath Beak MOA and overlying ATCAAs, Lava airspace, and McGregor Range airspace. Increases in DNL_{mr}, CDNL, and sonic booms are expected to result in additional annoyance in affected persons. As described in Section 3.2, individual overflights would have the potential to interfere with activities such as conversation and sleeping and low-altitude, high-speed overflights could result in startle effects. The specific effects of an overflight event depend heavily on situation-specific factors such as the activity being conducted at the time of the overflight. If a person feels that his or her property has been damaged by sonic booms caused by aircraft based at Holloman AFB, he or she should contact the Holloman AFB Public Affairs Office to initiate a claim. As stated in Section HO 3.2.1, F-35A subsonic noise is not expected to cause damage to structures. Additional discussions on the risk of damage to structures caused by subsonic aircraft noise can be found in Section HO 3.9, Cultural Resources.



Source: Plotkin et al. 1990.

Figure HO 3.2–9. Cumulative Distribution of Peak Overpressures

Under the beddown scenarios, F-35A aircraft would conduct munitions training with live and inert munitions at Red Rio, Centennial, and Oscura Ranges. Centennial and Oscura Ranges are not authorized for live munitions use. Inert munitions, such as inert bombs and 25 millimeter rounds generate noise that is potentially disruptive only in the immediate vicinity of the location of use. As Centennial and Oscura Ranges are several miles from the nearest boundary non-DoD lands, noise impacts in off-range locations would be minimal. Noise associated with proposed live munitions use at Red Rio Range and current munitions use was modeled using the program BNOISE2. Noise levels greater than 62 dB CDNL would extend no farther than 2.3 NM from the target site under any of the beddown scenarios. The nearest border of WSMR with non-DoD lands is 3.4 miles from the target site. Noise generated by live munitions use may be audible in off-range locations, but would be relatively infrequent.

Auxiliary Airfields

Biggs AAF and EPIA. Under all Holloman AFB beddown scenarios, Biggs AAF and EPIA would be used for practice approaches by F-35A aircraft. Because the two airfields are close to each other, noise generated at one affects noise levels at the other, and noise impacts at the two runways are discussed together. However, as different (but adjacent) areas are affected by noise generated at the two airfields, separate impact analyses were run to allow the areas of impact to be clearly distinguished. Noise contours under Scenarios H1, H2, H3, H4, and H5 at the two airfields are shown in Figures HO 3.2–10, HO 3.2–11, HO 3.2–12, HO 3.2–13, and HO 3.2–14, respectively, overlaid on baseline noise contours. Scenarios H1W, H2W, and H3W would be exactly the same as Scenarios H1, H2, and H3 in terms of F-35A operations and noise generated at Biggs AAF and EPIA.

RIAC. Under all Holloman AFB beddown scenarios, RIAC would be used for practice approaches by F-35A aircraft. Noise contours under Scenarios H1W, H2W, H3W, H1, H2, H3, H4, and H5 are shown in Figures HO 3.2–15, HO 3.2–16, HO 3.2–17, HO 3.2–18, HO 3.2–19, HO 3.2–20, HO 3.2–21, and HO 3.2–22. In all figures, noise contours associated with the beddown scenario are overlaid on baseline noise contours. The area affected by noise levels greater than 65 dB DNL would increase by approximately 781, 633, and 1,192 acres under Scenarios H1W, H2W, and H3W. Area exposed to noise levels greater than 65 dB DNL would decrease under Scenario H1 by 277 acres, but would increase by 435 acres, 1,042 acres, 1,592 acres, and 2,102 acres under Scenarios H2, H3, H4, and H5, respectively (see Table HO 3.2–7). The estimated number of residents affected by noise levels greater than 65 dB DNL under Scenarios H1W, H2W, H3W, H1, H2, H3, H4, and H5 would increase by 108, 194, 297, 5, 103, 186, 307, and 497 persons, respectively. Persons exposed to increased noise levels, particularly those exceeding 65 dB DNL, may experience increased annoyance and activity interference. No persons live within the 80 dB DNL noise contour at RIAC under any scenario; therefore, according to standard Air Force potential hearing loss risk assessment methodology, hearing loss risk would be minimal.

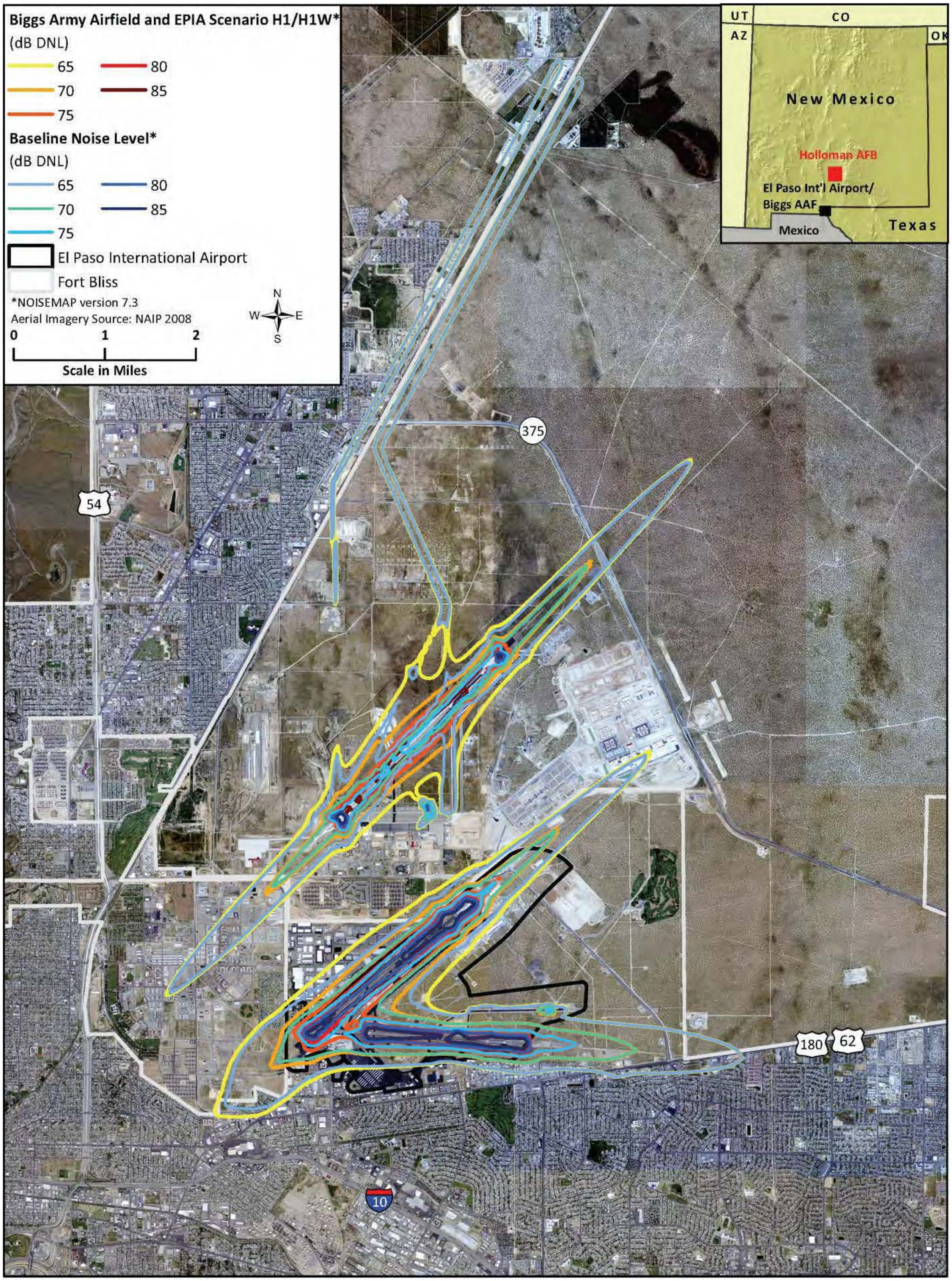


Figure HO 3.2–10. Scenario H1/H1W and Baseline Noise Contours at Biggs AAF and EPIA

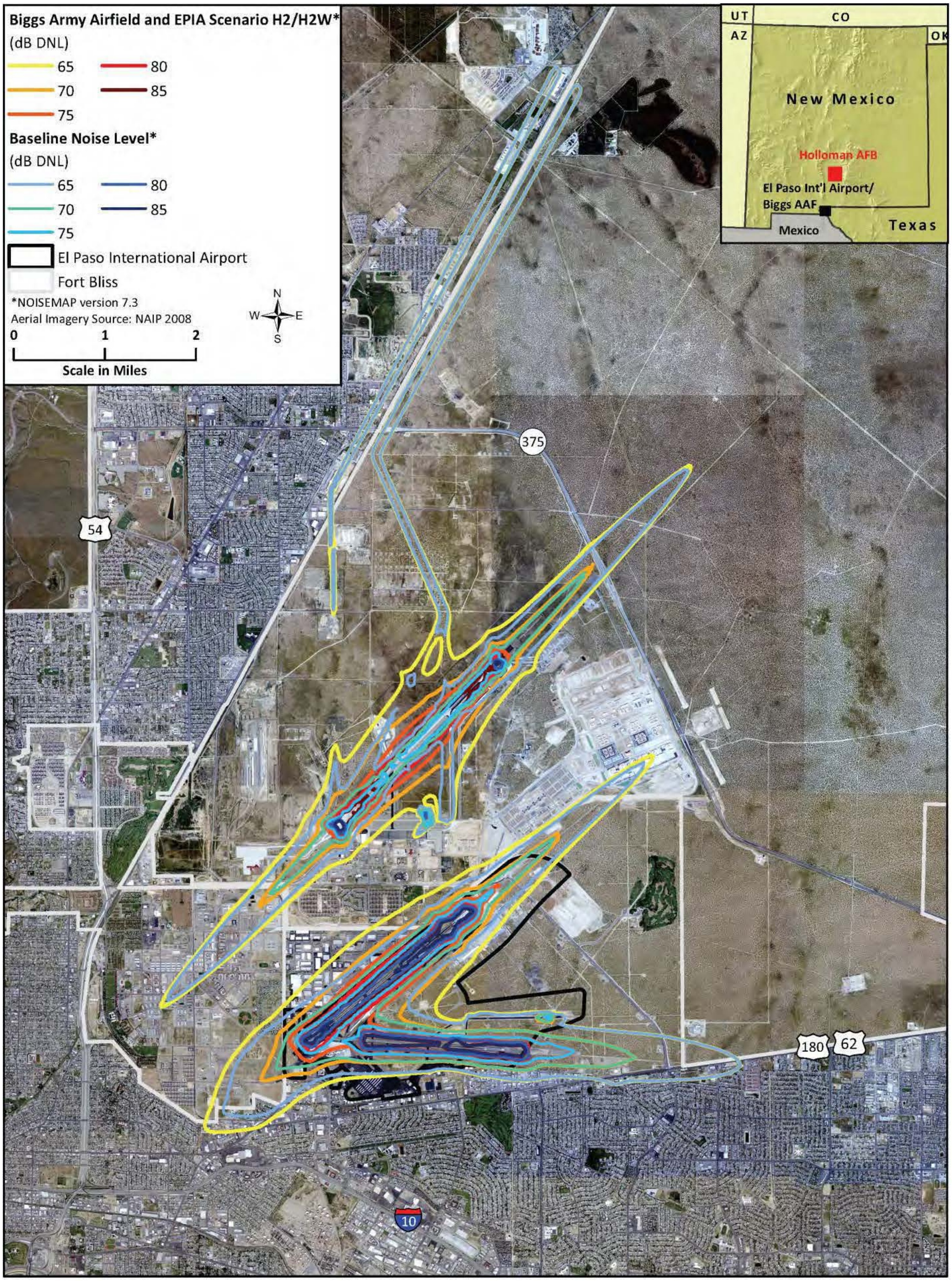


Figure HO 3.2–11. Scenario H2/H2W and Baseline Noise Contours at Biggs AAF and EPIA

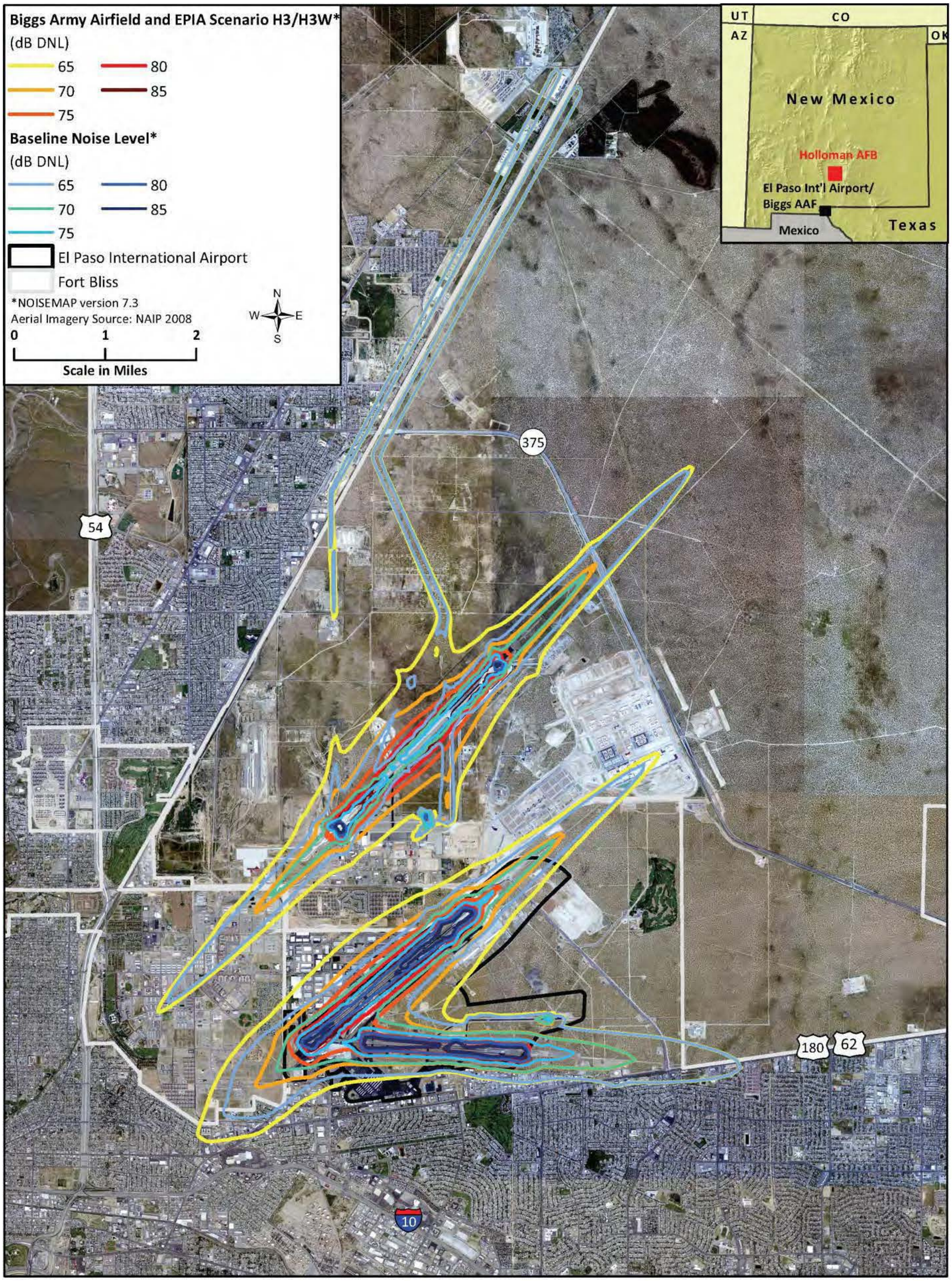


Figure HO 3.2–12. Scenario H3/H3W and Baseline Noise Contours at Biggs AAF and EPIA

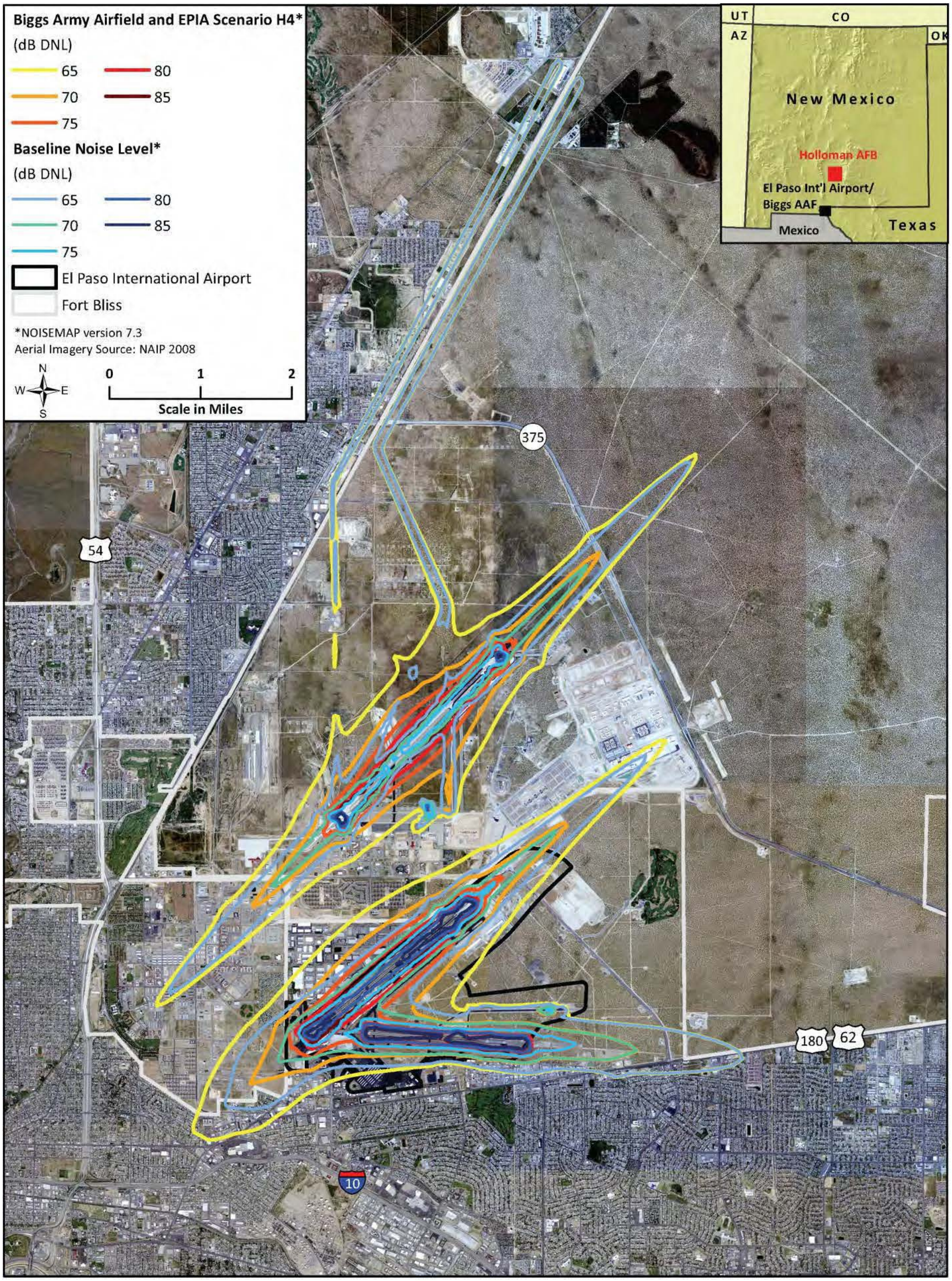


Figure HO 3.2–13. Scenario H4 and Baseline Noise Contours at Biggs AAF and EPIA

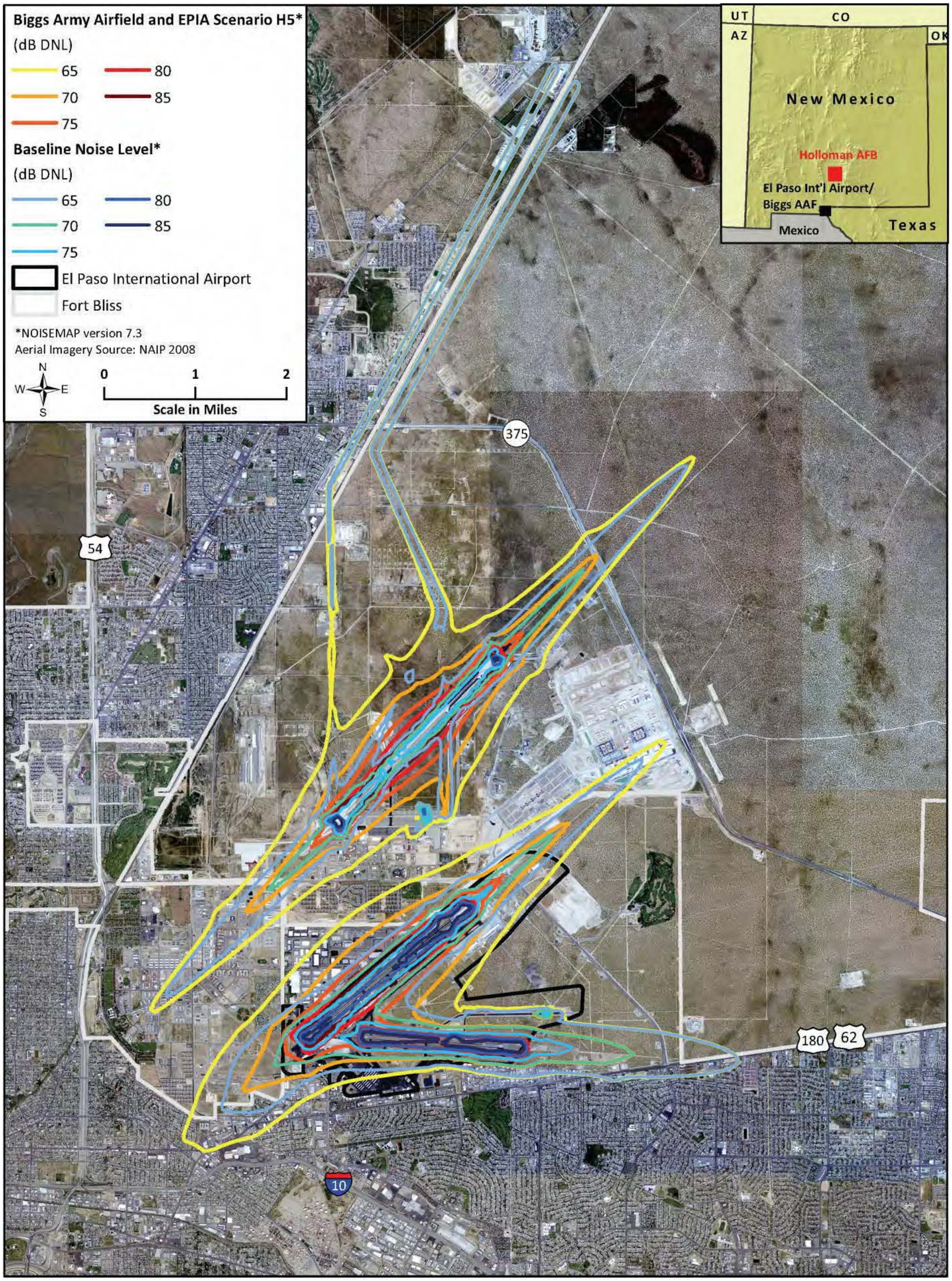


Figure HO 3.2–14. Scenario H5 and Baseline Noise Contours at Biggs AAF and EPIA

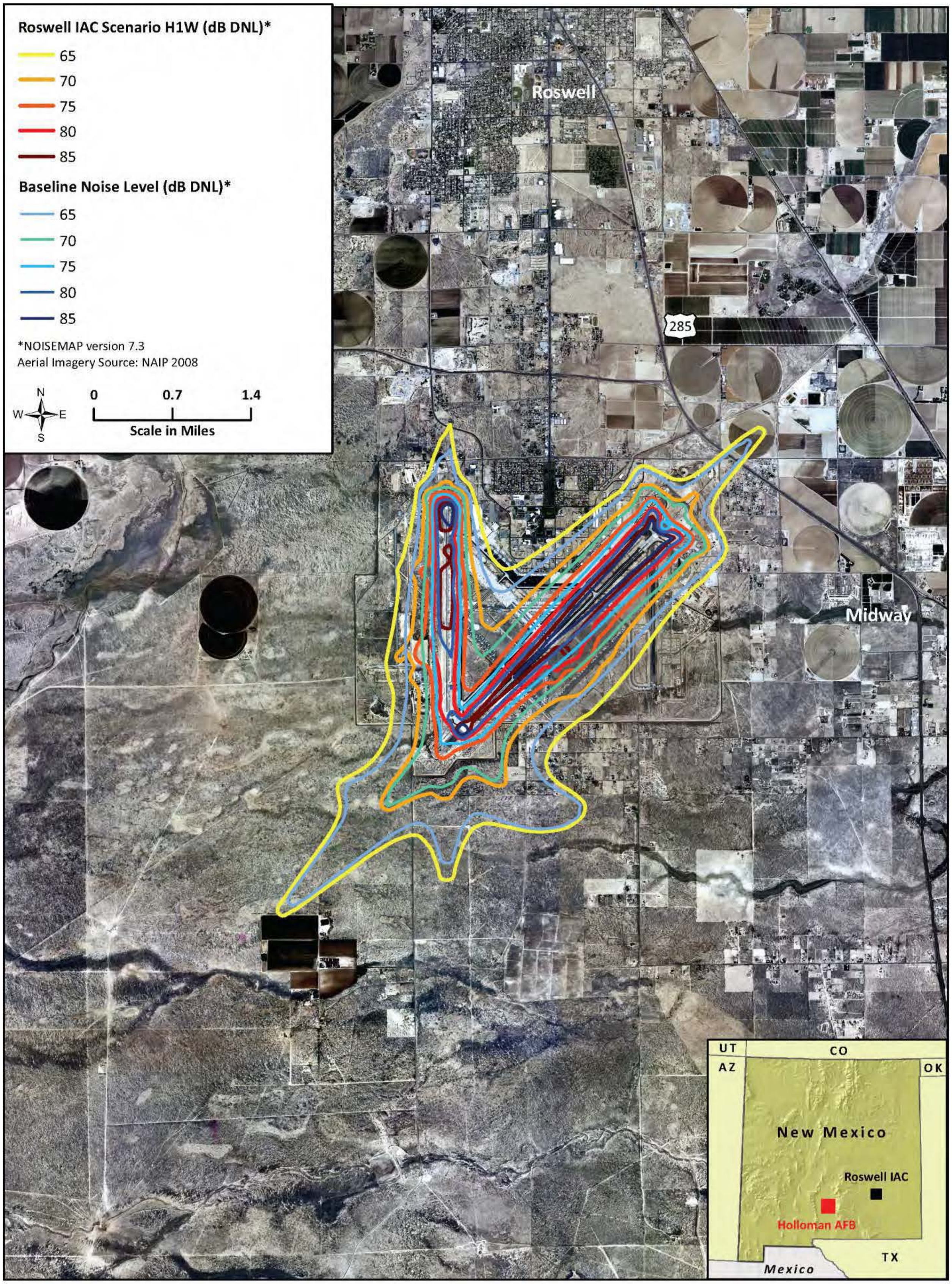


Figure HO 3.2–15. Scenario H1W and Baseline Noise Contours at RIAC

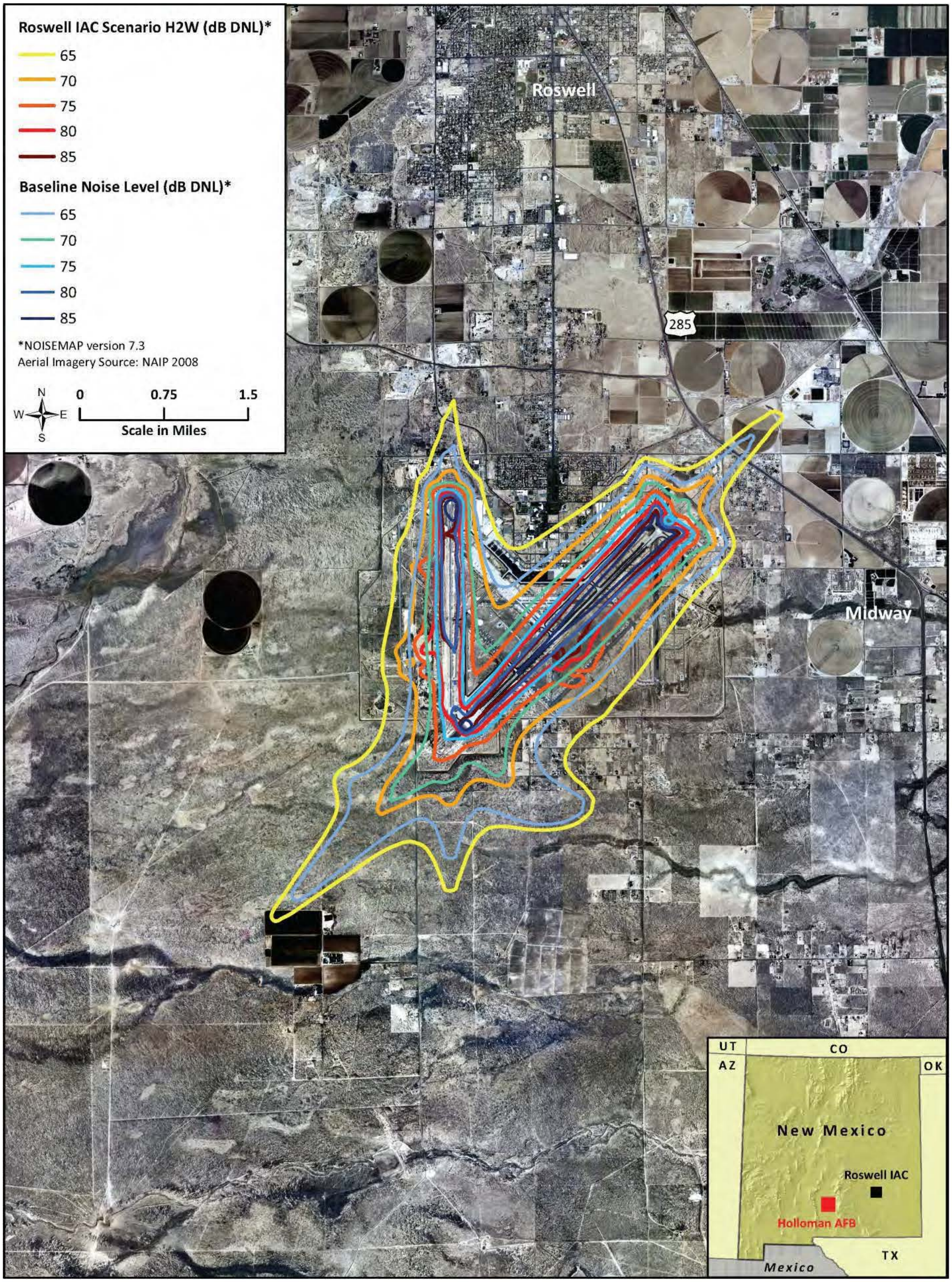


Figure HO 3.2–16. Scenario H2W and Baseline Noise Contours at RIAC

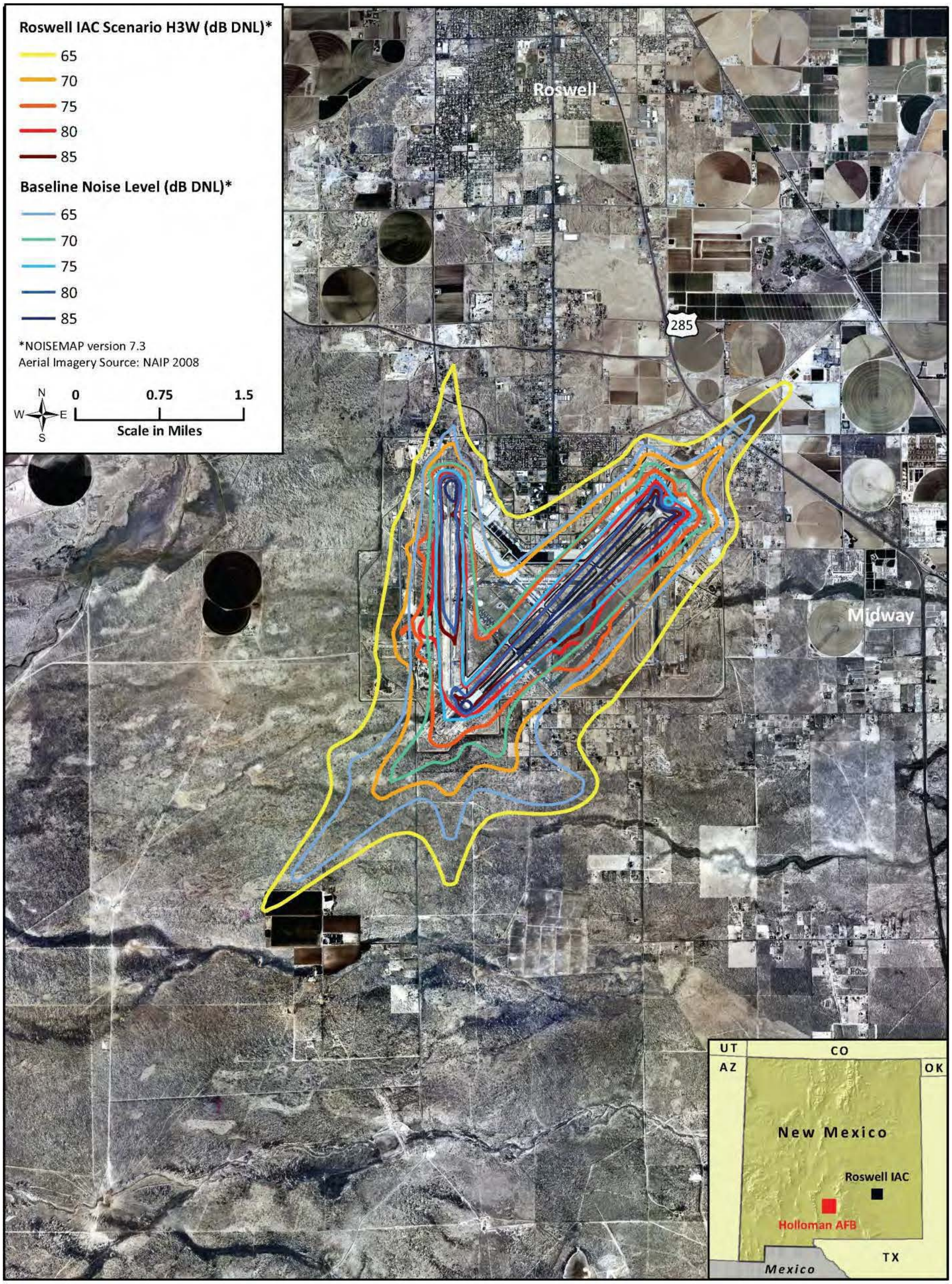


Figure HO 3.2–17. Scenario H3W and Baseline Noise Contours at RIAC

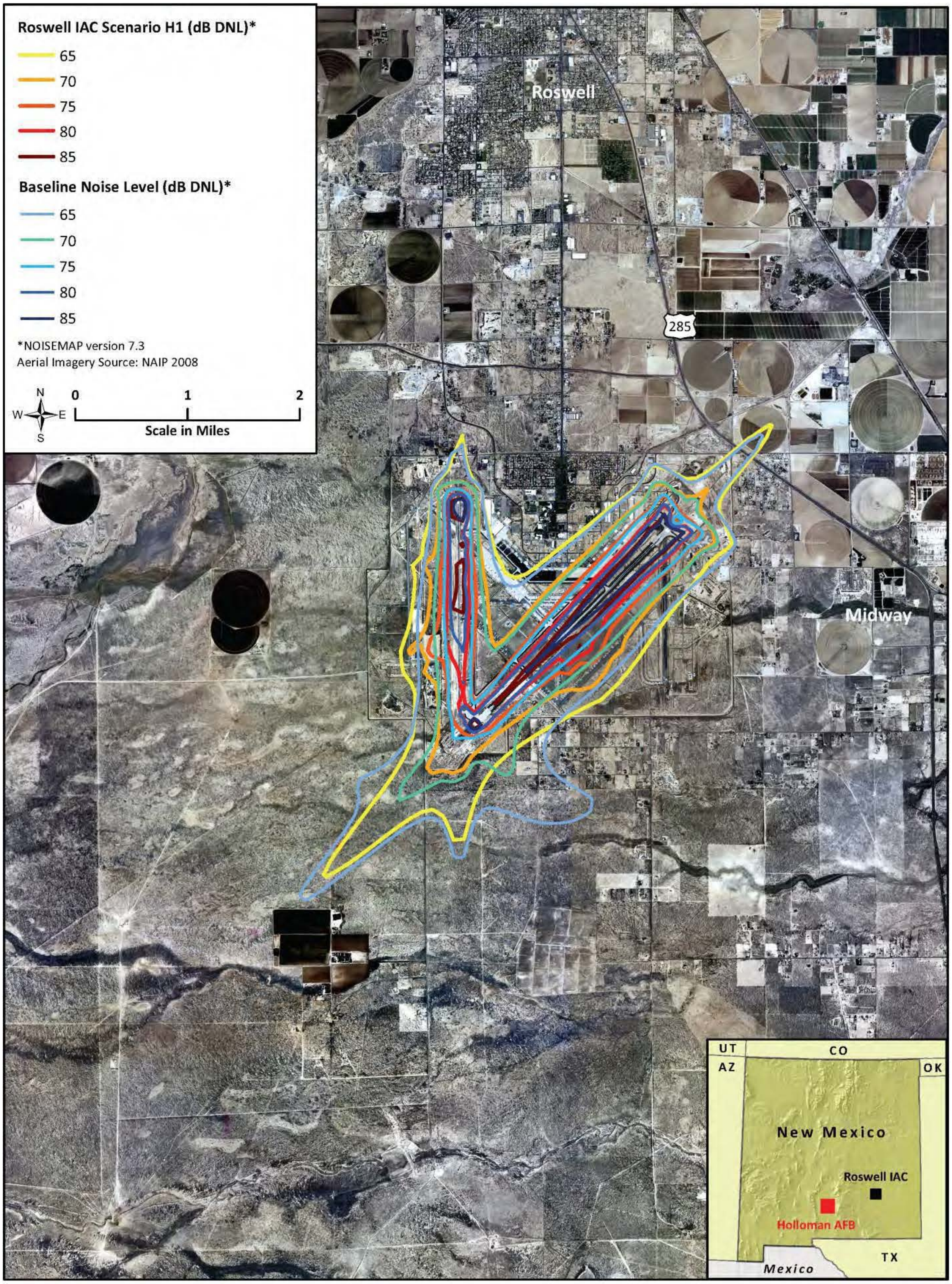


Figure HO 3.2–18. Scenario H1 and Baseline Noise Contours at RIAC

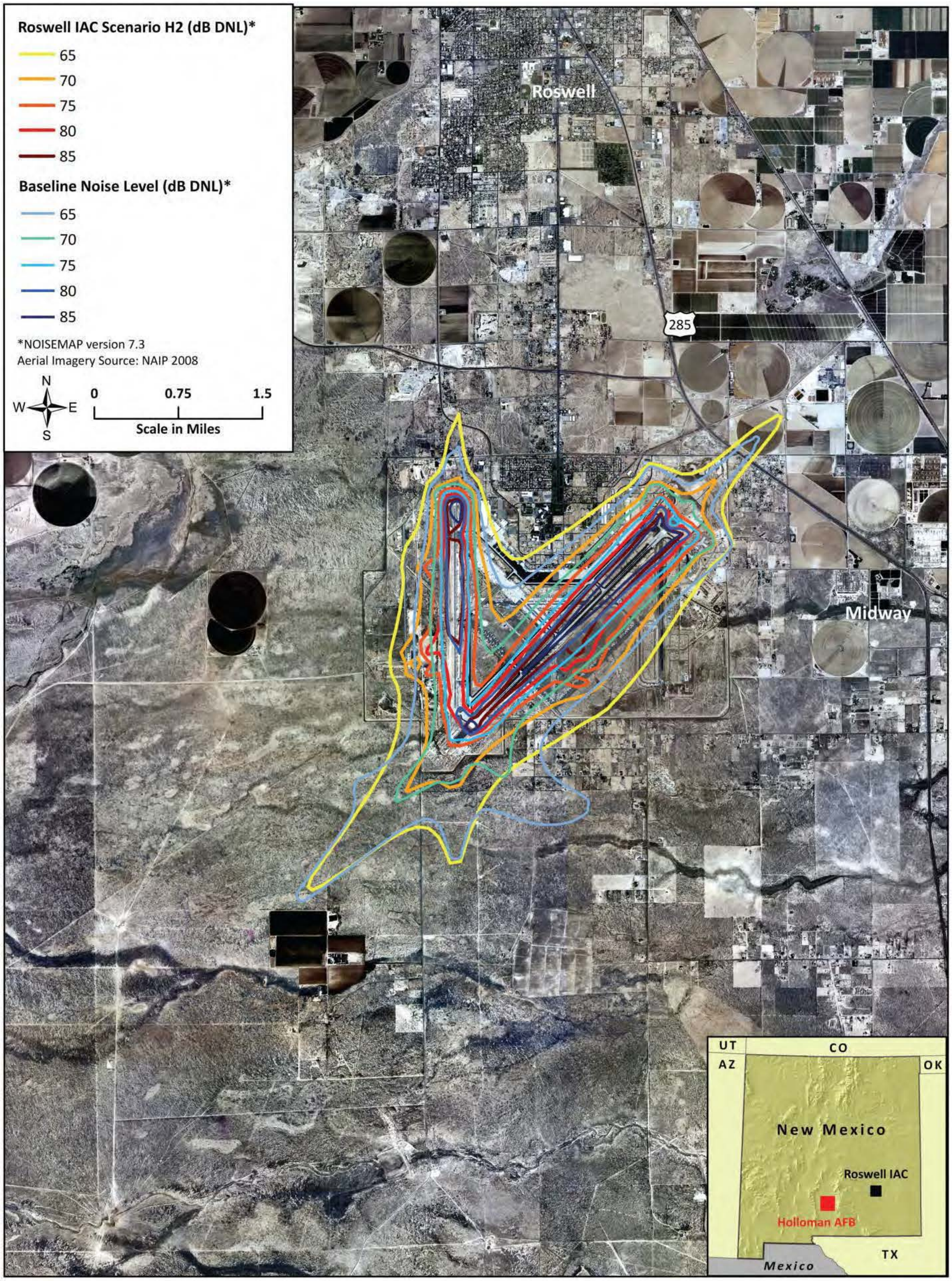


Figure HO 3.2–19. Scenario H2 and Baseline Noise Contours at RIAC

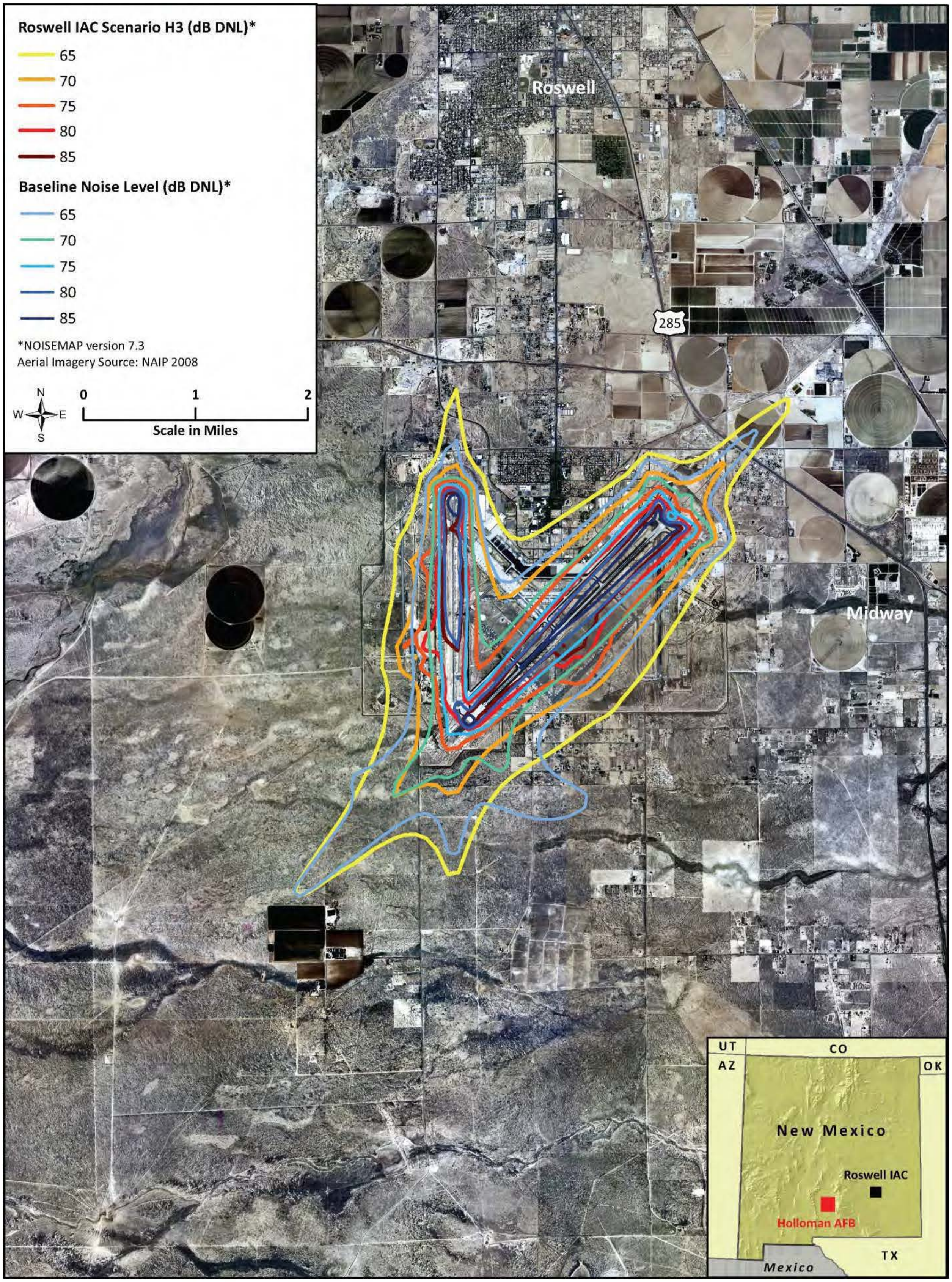


Figure HO 3.2–20. Scenario H3 and Baseline Noise Contours at RIAC

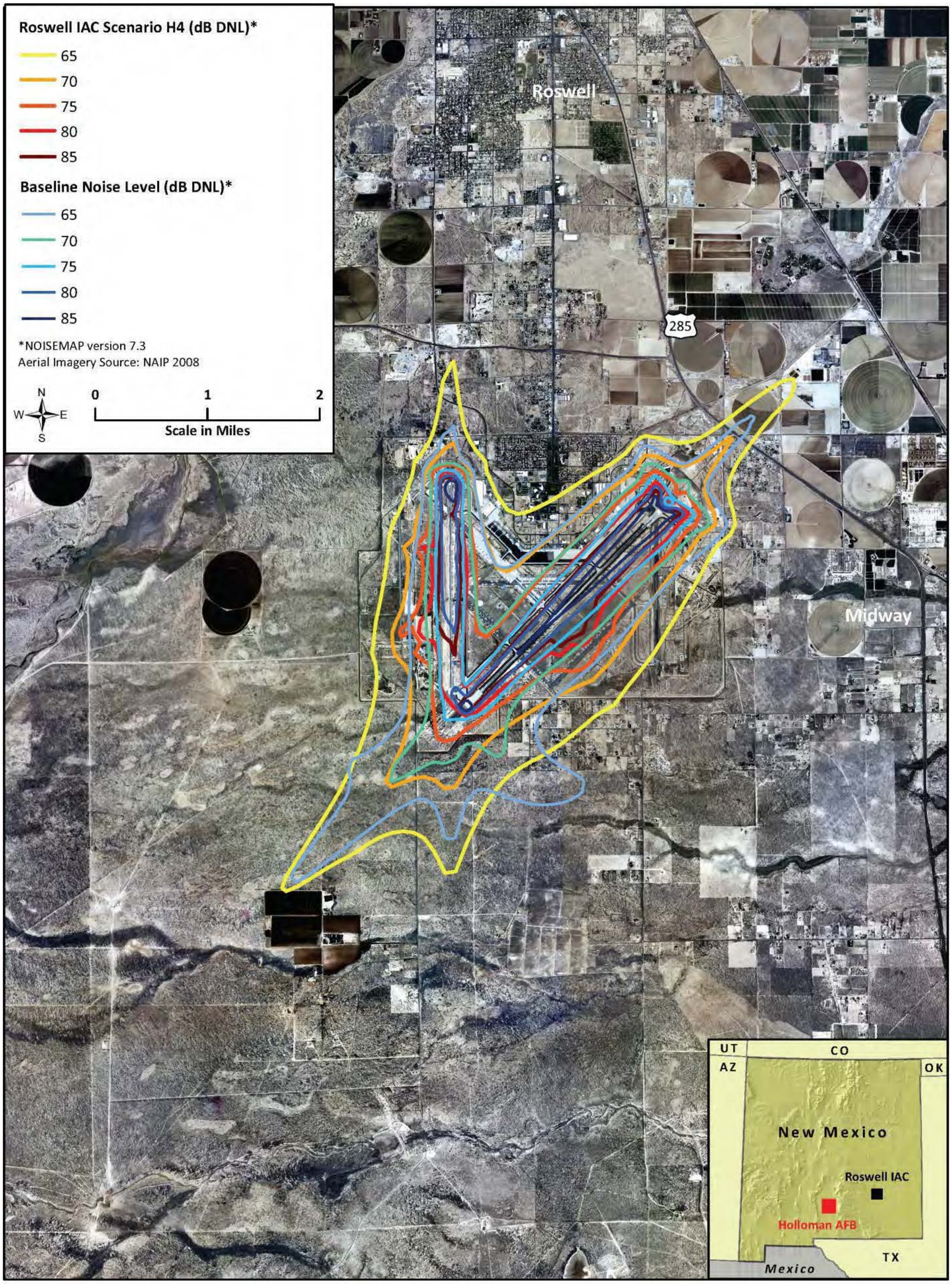


Figure HO 3.2–21. Scenario H4 and Baseline Noise Contours at RIAC

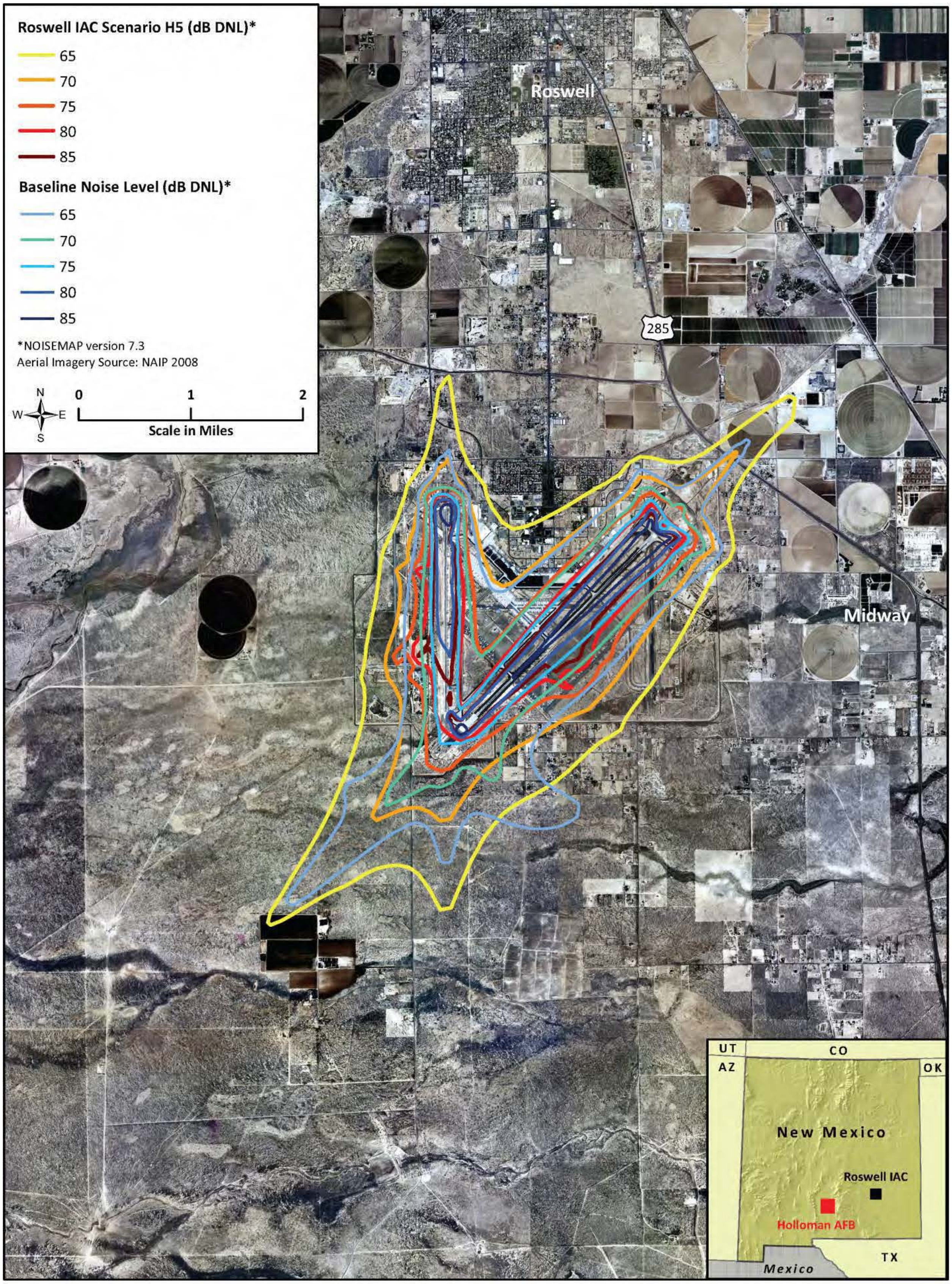


Figure HO 3.2–22. Scenario H5 and Baseline Noise Contours at RIAC

Table HO 3.2–7. Population and Acreage Under Noise Contours Near RIAC, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (On- and Off-Airport)*		*Total Area Affected (On- and Off-Airport)*	
	Number	**Change**	**Acres**	**Change**
Baseline Conditions				
Total ≥ 65	**61**	**N/A**	**3,703**	**N/A**
65–69	60	N/A	1,819	N/A
70–74	1	N/A	904	N/A
75–79	0	N/A	490	N/A
80–84	0	N/A	351	N/A
≥ 85	0	N/A	139	N/A
Scenario H1W (24 Aircraft)				
Total ≥ 65	**169**	**108**	**4,484**	**781**
65–69	167	107	2,111	292
70–74	2	1	1,068	164
75–79	0	0	560	70
80–84	0	0	435	84
≥ 85	0	0	310	171
Scenarios H2W (48 Aircraft)				
Total ≥ 65	**255**	**194**	**5,117**	**633**
65–69	249	189	2,394	283
70–74	6	5	1,181	113
75–79	0	0	661	101
80–84	0	0	442	7
≥ 85	0	0	439	129
Scenarios H3W (72 Aircraft)				
Total ≥ 65	**358**	**297**	**5,676**	**1,192**
65–69	338	278	2,659	548
70–74	20	19	1,290	222
75–79	0	0	742	182
80–84	0	0	455	20
≥ 85	0	0	530	220
Scenario H1 (24 Aircraft)				
Total ≥ 65	**66**	**5**	**3,426**	**(277)**
65–69	66	6	1,483	(336)
70–74	0	(1)	827	(77)
75–79	0	0	476	(14)
80–84	0	0	411	60
≥ 85	0	0	229	90
Scenario H2 (48 Aircraft)				
Total ≥ 65	**164**	**103**	**4,138**	**435**
65–69	163	103	1,799	(20)
70–74	1	0	964	60
75–79	0	0	566	76
80–84	0	0	422	71
≥ 85	0	0	387	248
Scenario H3 (72 Aircraft)				
Total ≥ 65	**247**	**186**	**4,745**	**1,042**
65–69	240	180	2,086	267
70–74	7	6	1,079	175
75–79	0	0	657	167
80–84	0	0	435	84
≥ 85	0	0	530	349

Contour Interval (dB DNL)	Population Affected (On- and Off-Airport)		Total Area Affected (On- and Off-Airport)	
	Number	Change	Acres	Change
Scenario H4 (96 Aircraft)				
Total ≥ 65	**368**	**307**	**5,295**	**1,592**
65–69	345	285	2,359	540
70–74	23	22	1,189	285
75–79	0	0	719	229
80–84	0	0	461	110
≥ 85	0	0	567	428
Scenario H5 (120 Aircraft)				
Total ≥ 65	**558**	**497**	**5,805**	**2,102**
65–69	509	449	2,616	797
70–74	49	48	1,292	388
75–79	0	0	779	289
80–84	0	0	482	131
≥ 85	0	0	636	497

Extensive mission changes are under way at Fort Bliss, including beddown of a CAB at Biggs AAF. Biggs AAF baseline noise contours and all F-35A beddown scenario noise contours include noise generated by operations of the CAB. The FAA's Terminal Area Forecast for EPIA does not predict any steady growth or reduction in airfield operations counts in coming years. Therefore, no change in military or civilian aircraft airfield operations was modeled. Noise levels at Biggs AAF were modeled using NOISEMAP Version 7.3, whereas those at EPIA were modeled using NOISEMAP Version 7.3 for military aircraft operations and the Integrated Noise Model for civilian aircraft operations.

At Biggs AAF, the off-installation area affected by noise levels greater than 65 dB DNL would increase by 2, 5, 8, 11, and 13 acres under Scenarios H1, H2, H3, H4, and H5, respectively (see Table HO 3.2–8). The on-installation area affected by noise levels greater than 65 dB DNL would increase by 756, 1,196, 1,579, 1,912, and 2,255 acres under Scenarios H1, H2, H3, H4, and H5, respectively. The estimated number of off-installation residents affected by noise levels greater than 65 dB DNL under Scenarios H1, H2, H3, H4, and H5 would increase by 29, 63, 98, 131, and 148, respectively. Persons exposed to increased noise levels, particularly those exceeding 65 dB DNL, may experience increased annoyance and activity interference. No persons live within the 80 dB DNL noise contour at Biggs AAF under any scenario; therefore, according to standard Air Force hearing loss risk assessment methodology, hearing loss risk would be minimal.

At EPIA, the off-installation area affected by noise levels greater than 65 dB DNL would increase by approximately 187, 325, 447, 567, and 686 acres under Scenarios H1, H2, H3, H4, and H5, respectively (see Table HO 3.2–9). The number of on-installation acres affected by noise levels greater than 65 dB DNL would increase by 251, 478, 689, 887, and 1,072 acres under Scenarios H1, H2, H3, H4, and H5, respectively. The estimated number of off-installation residents affected by noise levels greater than 65 dB DNL under Scenarios H1, H2, H3, H4, and H5 would increase by 348, 946, 1,295, 1,562, and 1,884, respectively. Persons exposed to increased noise levels, particularly those exceeding 65 dB DNL, may experience increased annoyance and activity interference. No residences exist within the 80 dB DNL noise contour at EPIA under any scenario; therefore, according to standard Air Force hearing loss risk assessment methodology, hearing loss risk would be minimal.

Table HO 3.2–8. Population and Acreage Under Noise Contours Near Biggs AAF, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation)*		*Total Area Affected (Off-Installation)*		*Total Area Affected (On-Installation)*	
	Number	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions						
Total ≥ 65	**638**	**N/A**	**257**	**N/A**	**2,070**	**N/A**
65–69	621	N/A	255	N/A	1,585	N/A
70–74	17	N/A	2	N/A	318	N/A
75–79	0	N/A	0	N/A	152	N/A
80–84	0	N/A	0	N/A	10	N/A
≥ 85	0	N/A	0	N/A	5	N/A
Scenarios H1 and H1W (24 Aircraft)						
Total ≥ 65	**667**	**29**	**259**	**2**	**2,826**	**756**
65–69	643	22	257	2	1,947	362
70–74	24	7	2	0	473	155
75–79	0	0	0	0	165	13
80–84	0	0	0	0	146	136
≥ 85	0	0	0	0	95	90
Scenarios H2 and H2W (48 Aircraft)						
Total ≥ 65	**701**	**63**	**262**	**5**	**3,266**	**1,196**
65–69	666	45	259	4	2,166	581
70–74	35	18	3	1	586	268
75–79	0	0	0	0	203	51
80–84	0	0	0	0	144	134
≥ 85	0	0	0	0	167	162
Scenarios H3 and H3W (72 Aircraft)						
Total ≥ 65	**736**	**98**	**265**	**8**	**3,649**	**1,579**
65–69	688	67	262	7	2,369	784
70–74	48	31	3	1	679	361
75–79	0	0	0	0	240	88
80–84	0	0	0	0	147	137
≥ 85	0	0	0	0	214	209
Scenario H4 (96 Aircraft)						
Total ≥ 65	**769**	**131**	**268**	**11**	**3,982**	**1,912**
65–69	709	88	264	9	2,542	957
70–74	60	43	4	2	757	439
75–79	0	0	0	0	279	127
80–84	0	0	0	0	159	149
≥ 85	0	0	0	0	245	240
Scenario H5 (120 Aircraft)						
Total ≥ 65	**786**	**148**	**270**	**13**	**4,325**	**2,255**
65–69	714	93	266	11	2,737	1,152
70–74	72	55	4	2	828	510
75–79	0	0	0	0	316	164
80–84	0	0	0	0	169	159
≥ 85	0	0	0	0	275	270

Note: (Number) denotes a negative number.

Table HO 3.2–9. Population and Acreage Under Noise Contours Near EPIA, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Airport/Installation)*		*Total Area Affected (Off-Airport/Installation)*		*Total Area Affected (On-Airport/Installation)*	
	Number	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions						
Total ≥ 65	**1,295**	**N/A**	**1,201**	**N/A**	**2,176**	**N/A**
65–69	1,295	N/A	912	N/A	966	N/A
70–74	0	N/A	236	N/A	542	N/A
75–79	0	N/A	48	N/A	300	N/A
80–84	0	N/A	4	N/A	222	N/A
≥ 85	0	N/A	1	N/A	146	N/A
Scenarios H1 and H1W (24 Aircraft)						
Total ≥ 65	**1,643**	**348**	**1,388**	**187**	**2,427**	**251**
65–69	1,643	348	999	87	1,072	106
70–74	0	0	305	69	532	(10)
75–79	0	0	79	31	337	37
80–84	0	0	4	0	241	19
≥ 85	0	0	1	0	245	99
Scenarios H2 and H2W (48 Aircraft)						
Total ≥ 65	**2,241**	**946**	**1,526**	**325**	**2,654**	**478**
65–69	2,240	945	1,076	164	1,181	215
70–74	1	1	326	90	581	39
75–79	0	0	120	72	339	39
80–84	0	0	4	0	252	30
≥ 85	0	0	0	(1)	301	155
Scenarios H3 and H3W (72 Aircraft)						
Total ≥ 65	**2,590**	**1,295**	**1,648**	**447**	**2,865**	**689**
65–69	2,589	1,294	1,148	236	1,289	323
70–74	1	1	344	108	633	91
75–79	0	0	143	95	347	47
80–84	0	0	12	8	257	35
≥ 85	0	0	1	0	339	193
Scenario H4 (96 Aircraft)						
Total ≥ 65	**2,857**	**1,562**	**1,768**	**567**	**3,061**	**887**
65–69	2,856	1,561	1,225	313	1,391	425
70–74	1	1	361	125	683	141
75–79	0	0	156	108	360	61
80–84	0	0	25	21	258	36
≥ 85	0	0	1	0	369	224
Scenario H5 (120 Aircraft)						
Total ≥ 65	**3,179**	**1,884**	**1,887**	**686**	**3,248**	**1,072**
65–69	3,178	1,883	1,302	390	1,491	525
70–74	1	1	380	144	729	187
75–79	0	0	165	117	377	77
80–84	0	0	39	35	256	34
≥ 85	0	0	1	0	395	249

Note: (Number) denotes a negative number.

HO 3.3 Air Quality

HO 3.3.1 Base

HO 3.3.1.1 Base Affected Environment

Air quality at a given location can be described by the concentrations of various air pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing its concentration to an appropriate Federal and/or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which public health and welfare are protected including a reasonable margin of safety to protect the more sensitive individuals in the population. The U.S. Environmental Protection Agency (EPA) established the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. Units of concentration for these standards are generally expressed in parts per million or micrograms per cubic meter. State standards, established by the New Mexico Environmental Improvement Board and enforced by the New Mexico Air Quality Bureau (AQB), are termed the New Mexico Ambient Air Quality Standards (NMAAQS). The NMAAQS are at least as restrictive as the NAAQS and include standards for total suspended particulate matter for which there are no Federal standards. Table 3–3 in Chapter 3, Section 3.3, presents the NAAQS.

Region of Influence

Air emissions produced from construction and operation of the beddown of F-35A aircraft at Holloman AFB would mainly affect air quality within Otero County. Potential aircraft operations would also affect air quality within training areas associated with Holloman AFB and aircraft flight routes between these locations. Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as CO and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as O_3 may extend much farther downwind than for inert pollutants. O_3 is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. O_3 precursors are mainly nitrogen oxides (NO_X) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O_3 levels usually occurs several hours after they are emitted and many miles from their source.

Existing Air Quality

The EPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area generally is in nonattainment for a pollutant if the applicable NAAQS has been exceeded more than once per year. Former nonattainment areas that have attained the NAAQS are designated as maintenance areas. Currently, Otero County is in attainment of the NAAQS for all pollutants.

Regional Air Emissions. Holloman AFB is located in Otero County. Table HO 3.3–1 summarizes estimates of the annual emissions generated by this region in 2008 (EPA 2011). The majority of emissions within the region occur from (1) on-road and nonroad mobile sources (VOCs, CO, and NO_X), (2) solvent/surface coating usages (VOCs), and (3) fugitive dust (PM_{10}/$PM_{2.5}$).

Table HO 3.3–1. Annual Emissions for Otero County, New Mexico, Calendar Year 2008

Source Type	*Air Pollutant Emissions (tons per year)*					
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Stationary Sources	1,120	1,291	125	3	29,690	3,123
Mobile Sources	1,463	13,340	2,346	27	102	85
Total	**2,582**	**14,631**	**2,471**	**30**	**29,794**	**3,208**

Source: EPA 2011.

Holloman AFB Emissions. Operational emissions due to existing operations at Holloman AFB occur from (1) aircraft operations and engine maintenance/testing, (2) onsite personally and government-owned vehicles (POVs and GOVs), (3) offsite POV commutes, (4) aerospace ground equipment (AGE), (5) nonroad mobile equipment, and (6) stationary and other sources. Table HO 3.3–2 summarizes the most recent estimate of annual operational emissions that occurred at Holloman AFB (calendar year 2003) (Holloman AFB 2004a). These data also are used to estimate non-aircraft source emissions for future project scenarios at Holloman AFB.

Table HO 3.3–2. Annual Emissions from Existing Operations at Holloman AFB, Calendar Year 2010

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Aircraft Operations	83.16	572.36	417.56	27.62	45.90	45.54	108,909
Onsite POVs/GOVs	15.22	136.18	150.99	0.04	19.19	19.19	1,435
Offsite POVs	41.46	325.14	24.36	0.04	1.30	1.30	1,525
Stationary Sources	100.79	21.61	21.18	1.63	12.27	12.27	551
Total Emissions	**240.64**	**1,055.30**	**614.08**	**29.33**	**78.66**	**78.30**	**112,420**

Key: CO_{2e}=carbon dioxide equivalent.
Source: Holloman AFB 2004a.

Table HO 3.3–3 summarizes the annual emissions at Holloman AFB due to F-16 operations in the base case year of 2013. Emissions from projected POV, GOV, and stationary sources were estimated by multiplying emissions from 2003 operations by the ratio of the 2013 F-16 employment population and total 2003 Holloman AFB employment population.

Table HO 3.3–3. Annual Emissions from F-16 Operations at Holloman AFB, Year 2013 Base Case

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
F-16 Operations	68.73	223.91	132.67	11.29	7.78	7.78	37,037
AGE	0.46	1.23	8.17	0.37	0.44	0.40	313
Onsite POVs/GOVs	1.80	18.49	17.37	0.01	2.62	2.62	437
Offsite POVs	6.93	66.73	4.59	0.21	0.21	0.20	21,795
Stationary Sources	16.22	3.48	3.41	0.26	1.97	1.97	101.54
Total Emissions	**94.13**	**313.83**	**166.22**	**12.14**	**13.02**	**12.97**	**59,683**

Regional Climate

Meteorological data collected at Alamogordo, New Mexico, are used to describe the climate of the Holloman AFB project area (WRCC 2007a, 2007b, 2010).

Temperature. Otero County is known for high temperatures in the summer months and cool conditions during the winter. The average high and low temperatures during the summer months at Holloman AFB range from about 94 degrees Fahrenheit (°F) to 64 °F. The average high and low temperatures during the winter months range from 57 °F to 30 °F (WRCC 2010).

Precipitation. Average annual precipitation for Holloman AFB is 10.97 inches. More precipitation falls in the summer months, as the peak monthly average of 2.04 inches occurs in August. Spring receives the least amount of precipitation during the year, as the lowest monthly average of 0.36 inches occurs in April. Snow is not uncommon during winter. The average annual snowfall in Holloman AFB is 4.1 inches, with a peak monthly average of 1.5 inches in January (WRCC 2010).

Prevailing Winds. The Holloman AFB area is a fairly breezy location, as the monthly average wind speed for each month of the year is at least 8 miles per hour and the annual average wind speed is 9.6 miles per hour. Spring is generally the windiest season, as the peak average monthly winds of 11.8 miles per hour occur in April. The prevailing wind direction is from the south for most of the year, except in December, when it is from the north (WRCC 2007a, 2007b).

Applicable Regulations and Standards

In New Mexico, the AQB is responsible for enforcing air pollution regulations. The Federal Clean Air Act establishes air quality planning processes and requires areas in nonattainment of an NAAQS to develop a State Implementation Plan that details how the state will attain the standard within mandated timeframes. The requirements and compliance dates for attainment are based on the severity of the nonattainment classification of the area. The following summarizes the air quality rules and regulations that apply to the project actions.

State Regulations. The Clean Air Act and its subsequent amendments establish air quality regulations and the NAAQS and delegate the enforcement of these standards to the states. The AQB enforces the Federal and state ambient air quality standards by developing rules to regulate and permit stationary sources of air emissions. The New Mexico air quality regulations are found in the *New Mexico Administrative Code*, Title 20 (Environmental Protection), Chapter 2 (Air Quality) (NMAC 1995).

HO 3.3.1.2 Base Environmental Consequences

Air quality impacts from the F-35A beddown at Holloman AFB were reviewed in light of Federal and state air pollution standards and regulations. The project region is in attainment of all NAAQS. Therefore, the analysis used the Prevention of Significant Deterioration (PSD) threshold for new major sources of 250 tons per year of a pollutant as an indicator of significance or insignificance of projected air quality impacts.

Construction

F-35A Scenarios H1W, H2W, and H3W. Construction and/or renovation of airfield facilities would be required to accommodate the training facilities, hangars, taxiways, and maintenance and fueling facilities needed under Scenarios H1W, H2W, and H3W. Air quality impacts from projected construction activities would result from (1) combustive emissions due to the use of fossil-fuel-powered equipment and (2) fugitive dust emissions (PM_{10}/$PM_{2.5}$) due to the operation of equipment on exposed soil. Construction activity data developed by Air Force staff were used to estimate projected construction equipment usages and associated combustive and fugitive dust emissions (Air Force 2010b).

Factors needed to derive construction source emission rates were obtained from *Compilation of Air Pollution Emission Factors, AP-42, Volume I* (EPA 1995); the EPA NONROAD Model for nonroad construction equipment (EPA 2009); and the MOBILE6.2 Model for on-road vehicles (EPA 2003).

The analysis reduced fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels to simulate implementation of Best Management Practices (BMPs) for fugitive dust control. Chapter 3, Section 3.3, of this EIS lists these BMPs.

Table HO 3.3–4 presents estimates of emissions from construction activities that would occur under Scenario H3W at Holloman AFB. These data show that, for each year of construction, total emissions would fall well below the PSD thresholds used to indicate significance or insignificance. Therefore, temporary construction emissions under Scenarios H1W, H2W, and H3W would produce less than significant impacts on regional air quality. The main sources of PM_{10}/$PM_{2.5}$ emissions would occur as fugitive dust from the operation of equipment on unpaved surfaces.

Table HO 3.3–4. Scenario H3W Total Construction Emissions

Construction Activity	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
Arm/De-arm pad (EOR)	0.00	0.00	0.00	0.00	0.00	0.00	0.5
Pad, Dangerous Cargo (8 LOLA spots)	0.00	0.01	0.03	0.00	0.04	0.01	3.9
Holding Area Munitions Storage	0.02	0.12	0.20	0.01	0.08	0.03	25.9
Squadron Operations/AMU (with hangar space, shops, trailers)	0.08	0.42	0.67	0.02	0.70	0.13	87.9
Academic Training Center (3rd Squadron)	0.12	0.61	0.97	0.02	1.07	0.20	126.2
Operational Training Facility (classrooms-FTD)	0.02	0.09	0.14	0.00	0.04	0.02	18.7
Maintenance Hangars (2 bay WLT)	0.01	0.07	0.13	0.00	0.03	0.01	18.7
Battery Maintenance	0.00	0.00	0.01	0.00	0.00	0.00	0.9
Ejection Seat Maintenance	0.00	0.02	0.03	0.00	0.00	0.00	3.5
Engine Maintenance	0.00	0.01	0.01	0.00	0.00	0.00	1.1
Corrosion Control (2 bay, includes CRF inserts)	0.02	0.08	0.13	0.00	0.04	0.02	16.9
Corrosion Control (wash rack, 2 bay)	0.01	0.07	0.10	0.00	0.03	0.01	13.6
Fuel Cell Maintenance (2 bay)	0.01	0.06	0.10	0.00	0.03	0.01	13.5
Alternate Mission Equipment shop	0.04	0.21	0.34	0.01	0.19	0.05	43.9
Support (AGE) Maintenance Facility	0.00	0.00	0.01	0.00	0.05	0.01	1.6
General Purpose Warehouse (engine storage)	0.01	0.06	0.09	0.00	0.02	0.01	12.2
Communications Security Space	0.00	0.01	0.01	0.00	0.00	0.00	1.6
Wing Headquarters	0.05	0.27	0.44	0.01	0.25	0.06	57.1
Family Housing (500 homes)	0.76	3.96	6.32	0.16	9.01	1.49	825.8
Billeting	0.04	0.22	0.35	0.01	0.16	0.05	45.3
School, Dependent Elementary	0.04	0.24	0.37	0.01	0.18	0.05	48.1
Fitness Center	0.02	0.11	0.17	0.00	0.05	0.02	22.5
Child Development Center	0.03	0.18	0.28	0.01	0.11	0.04	37.2
Interim and Move Dominoes	0.03	0.15	0.24	0.01	0.09	0.03	31.6
Bulk Fuel Storage	0.01	0.07	0.12	0.00	0.05	0.02	15.0
Electrical Infrastructure	0.01	0.05	0.08	0.00	0.02	0.01	11.5
AGE Storage Area	0.00	0.02	0.04	0.00	0.01	0.00	5.2
Flightline Security Fence	0.01	0.04	0.07	0.00	0.01	0.01	9.1
Apron Re-stripe	0.00	0.00	0.00	0.00	0.00	0.00	0.6
Taxiway - Asphalt Removal	0.04	0.16	0.41	0.01	9.89	1.01	57.16
Taxiway - Pour Concrete	0.04	0.16	0.47	0.01	0.03	0.02	79.34
Parking Apron (Small) - Asphalt Removal	0.00	0.01	0.02	0.00	0.38	0.04	2.19
Parking Apron (Small) - Pour Concrete	0.00	0.00	0.01	0.00	0.00	0.00	2.01
Parking Apron (Large) - Asphalt Removal	0.03	0.12	0.32	0.01	15.04	1.52	43.52
Parking Apron (Large) - Pour Concrete	0.03	0.12	0.36	0.01	0.02	0.02	60.41
Storage Igloo - Earthen Berm Installation	0.00	0.01	0.03	0.00	0.07	0.01	3.79
Storage Igloo - Building Construction	0.01	0.04	0.06	0.00	0.01	0.01	7.44
2012 Subtotal	**1.49**	**7.77**	**13.13**	**0.31**	**37.70**	**4.92**	**1,75.5**
Squadron Operations/AMU (with hangar space)	0.07	0.35	0.57	0.02	0.57	0.11	78.9
Dormitory	0.10	0.51	0.82	0.02	0.88	0.16	114.2
Billeting	0.04	0.20	0.32	0.01	0.16	0.05	45.3
2013 Subtotal	**0.20**	**1.06**	**1.71**	**0.05**	**1.61**	**0.32**	**238.4**
Squadron Operations/AMU (with hangar space)	0.06	0.32	0.53	0.01	0.56	0.11	78.8
Dormitory	0.10	0.51	0.82	0.02	0.88	0.16	114.2
Billeting	0.04	0.20	0.32	0.01	0.16	0.05	45.3
2014 Subtotal	**0.20**	**1.03**	**1.67**	**0.04**	**1.60**	**0.32**	**238.3**
Total Emissions	**1.90**	**9.86**	**16.51**	**0.40**	**40.91**	**5.56**	**2,231.2**

Key: AMU=Aircraft Maintenance Unit; FTD=Field Training Detachment; LOLA=Live Ordnance Loading Area.

F-35A Scenarios H1, H2, H3, H4, and H5. Table HO 3.3–5 presents estimates of emissions from construction activities that would occur under Scenario H5 at Holloman AFB. These data show that for each year of construction, total emissions would fall well below the PSD thresholds used to indicate significance or insignificance. Therefore, temporary construction emissions under Scenarios H1, H2, H3, H4, and H5 would produce less than significant impacts on regional air quality. The main sources of PM_{10}/$PM_{2.5}$ emissions would occur as fugitive dust from the operation of equipment on unpaved surfaces.

Table HO 3.3–5. Scenario H5 Total Construction Emissions

Construction Year	*Air Pollutant Emissions (tons)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
2012	0.37	1.79	3.53	0.08	26.23	2.88	497.92
2013	0.08	0.43	0.69	0.02	0.21	0.08	96.07
2014	0.39	2.01	3.31	0.09	3.41	0.65	495.11
2015	0.15	0.77	1.29	0.04	0.94	0.21	208.13
2016	0.64	3.17	5.73	0.17	23.02	2.81	997.99
Total Emissions	**1.63**	**8.17**	**14.55**	**0.40**	**53.81**	**6.65**	**2,295.2**

Operations

The air quality impact analysis of F-35A aircraft operations is based upon the increase in emissions associated with the operation of 24, 48, 72, 96, or 120 F-35A aircraft. The F-16 scenario starting point for the base case period for comparison to F-35A operations is 2013.

Sources associated with the beddown of F-35A aircraft at Holloman AFB would include (1) operations and engine maintenance/testing of F-35A aircraft, (2) onsite POVs and GOVs, (3) offsite POV commutes, (4) AGE, (5) nonroad mobile equipment, and (6) stationary and other sources. Operational data used to calculate projected F-35A aircraft emissions at Holloman AFB were obtained from data used in the project noise analyses (see Section HO 3.2). Emissions from projected POV, GOV, and stationary sources were estimated by multiplying emissions from 2003 operations by the ratio of the projected F-35A and 2003 Holloman AFB employment populations.

F-35A Scenarios H1W, H2W, and H3W. Tables HO 3.3–6, HO 3.3–7, and HO 3.3–8 summarize the annual emissions that would occur under Scenarios H1W, H2W, and H3W, respectively. These data show that the increase in emissions from the addition of 24 F-35A aircraft under Scenario H1W and 48 F-35A aircraft under Scenario H2W would not exceed 250 tons per year. Therefore, Scenarios H1W and H2W would produce less than significant air quality impacts. These data show that the increase in CO emissions from the addition of 72 F-35A aircraft under Scenario H3W would exceed 250 tons per year. The main contributors to these CO emission increases would include F-35A aircraft operations and POVs that would commute to and from Holloman AFB.

Table HO 3.3–6. Scenario H1W Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	1.51	48.36	45.30	4.73	0.75	0.75	15,609
Onsite POVs/GOVs	1.11	11.97	10.61	0.00	1.70	1.70	283
Offsite POVs	4.27	43.27	2.79	0.14	0.14	0.13	14,474
Stationary Sources	11.04	2.37	2.32	0.18	1.34	1.34	69
Total Projected Emissions – Scenario H1W	**17.93**	**105.96**	**61.02**	**5.05**	**3.93**	**3.92**	**30,436**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Table HO 3.3–7. Scenario H2W Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	3.02	96.72	90.60	9.45	1.50	1.50	31,219
Onsite POVs/GOVs	1.82	20.25	17.00	0.01	2.96	2.96	494
Offsite POVs	6.95	73.20	4.50	0.25	0.25	0.23	25,225
Stationary Sources	19.24	4.13	4.04	0.31	2.34	2.34	120
Total Projected Emissions – Scenario H2W	**31.03**	**194.30**	**116.14**	**10.02**	**7.05**	**7.03**	**57,058**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Table HO 3.3–8. Scenario H3W Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	4.54	145.08	135.91	14.18	2.25	2.25	46,828
Onsite POVs/GOVs	2.44	28.11	22.44	0.01	4.22	4.22	704
Offsite POVs	9.25	101.72	5.90	0.36	0.35	0.32	35,996
Stationary Sources	27.46	5.89	5.77	0.44	3.34	3.34	172
Total Projected Emissions – Scenario H3W	**43.68**	**280.79**	**170.01**	**14.99**	**10.16**	**10.13**	**83,701**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

The increase in CO emissions that would occur under Scenario H3W was compared with the most recent Otero County CO emissions inventory (year 2008) to determine the relative magnitude of this emission increase and, therefore, its potential to combine with existing emissions and contribute to an exceedance of an ambient air quality standard. In 2008, CO emissions produced within Otero County amounted to 14,631 tons (see Table HO 3.3–1). Review of Table HO 3.3–8 shows that the addition of 72 F-35A aircraft at Holloman AFB would increase CO emissions by 280.8 tons per year within Otero County. These emissions would amount to about 1.9 percent of the annual CO emissions generated by Otero County in 2008. The majority of projected CO emissions would occur from (1) F-35A aircraft ground and landing and takeoff activities and (2) offsite POV commutes. These emissions would occur across a wide area of the county and would not result in substantial impacts in a localized area. Given that the county also attains all NAAQS by wide margins, these emission increases would not

contribute to an exceedance of an ambient air quality standard. Therefore, operations under Scenarios H1W, H2W, and H3W would produce less than significant air quality impacts.

F-35A Scenarios H1, H2, H3, H4, and H5. Tables HO 3.3–9 through HO 3.3–13 summarize the annual emissions that would occur under Scenarios H1 through H5. These data show that the addition of 24, 48, or 72 F-35A aircraft under these scenarios would not result in net emission increases, other than nominal increases of NO_X and SO_2 emissions under Scenario H3. These data also show that the addition of 96 and 120 F-35A aircraft under Scenarios H4 and H5, respectively, would increase emissions of all pollutants other than VOCs compared with emissions from base operations. These emission increases would not exceed 250 tons per year. Therefore, activities under Scenario H1, H2, H3, H4, or H5 would produce less than significant air quality impacts. The main contributors to the projected emission increases would include F-35A aircraft operations, POVs that commute to and from Holloman AFB, and a variety of stationary sources on base.

Table HO 3.3–9. Scenario H1 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	1.51	48.36	45.30	4.73	0.75	0.75	15,609
Onsite POVs/GOVs	1.11	11.97	10.61	0.00	1.70	1.70	283
Offsite POVs	4.27	43.27	2.79	0.14	0.14	0.13	14,474
Stationary Sources	11.04	2.37	2.32	0.18	1.34	1.34	69
Total Projected Emissions – Scenario H1	**17.93**	**105.96**	**61.02**	**5.05**	**3.93**	**3.92**	**30,436**
F-16 Year 2013 Base Case Emissions	**(94.13)**	**(313.83)**	**(166.22)**	**(12.14)**	**(13.02)**	**(12.97)**	**(59,683)**
Scenario H1 Minus Base Case Emissions	**(76.20)**	**(207.87)**	**(105.19)**	**(7.09)**	**(9.09)**	**(9.05)**	**(29,247)**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Note: (Number) denotes a negative number.

Table HO 3.3–10. Scenario H2 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	3.02	96.72	90.60	9.45	1.50	1.50	31,219
Onsite POVs/GOVs	1.82	20.25	17.00	0.01	2.96	2.96	494
Offsite POVs	6.95	73.20	4.50	0.25	0.25	0.23	25,225
Stationary Sources	19.24	4.13	4.04	0.31	2.34	2.34	120
Total Projected Emissions – Scenario H2	**31.03**	**194.30**	**116.14**	**10.02**	**7.05**	**7.03**	**57,058**
F-16 Year 2013 Base Case Emissions	**(94.13)**	**(313.83)**	**(166.22)**	**(12.14)**	**(13.02)**	**(12.97)**	**(59,683)**
Scenario H2 Minus Base Case Emissions	**(63.10)**	**(119.54)**	**(50.08)**	**(2.12)**	**(5.98)**	**(5.95)**	**(2,625)**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Note: (Number) denotes a negative number.

Table HO 3.3–11. Scenario H3 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	4.54	145.08	135.91	14.18	2.25	2.25	46,828
Onsite POVs/GOVs	2.44	28.11	22.44	0.01	4.22	4.22	704
Offsite POVs	9.25	101.72	5.90	0.36	0.35	0.32	35,996
Stationary Sources	27.46	5.89	5.77	0.44	3.34	3.34	172
Total Projected Emissions – Scenario H3	**43.68**	**280.79**	**170.01**	**14.99**	**10.16**	**10.13**	**83,701**
F-16 Year 2013 Base Case Emissions	**(94.13)**	**(313.83)**	**(166.22)**	**(12.14)**	**(13.02)**	**(12.97)**	**(59,683)**
Scenario H3 Minus Base Case Emissions	**(50.46)**	**(33.04)**	**3.79**	**2.85**	**(2.86)**	**(2.84)**	**24,017**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Note: (Number) denotes a negative number.

Table HO 3.3–12. Scenario H4 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	6.05	193.44	181.21	18.90	3.00	3.00	62,438
Onsite POVs/GOVs	2.51	37.81	24.41	0.01	5.48	5.48	915
Offsite POVs	13.71	122.54	7.96	0.47	0.46	0.42	46,747
Stationary Sources	35.66	7.65	7.49	0.58	4.34	4.34	223
Total Projected Emissions – Scenario H4	**57.92**	**361.43**	**221.08**	**19.96**	**13.28**	**13.24**	**110,323**
F-16 Year 2013 Base Case Emissions	**(94.13)**	**(313.83)**	**(166.22)**	**(12.14)**	**(13.02)**	**(12.97)**	**(59,683)**
Scenario H4 Minus Base Case Emissions	**(36.21)**	**47.60**	**54.86**	**7.81**	**0.25**	**0.27**	**50,640**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Note: (Number) denotes a negative number.

Table HO 3.3–13. Scenario H5 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	7.56	241.80	226.51	23.63	3.74	3.74	78,047
Onsite POVs/GOVs	3.09	46.50	30.03	0.02	6.74	6.74	1,125
Offsite POVs	16.86	150.72	9.79	0.57	0.56	0.52	57,498
Stationary Sources	43.86	9.40	9.22	0.71	5.34	5.34	275
Total Projected Emissions – Scenario H5	**71.36**	**448.43**	**275.55**	**24.93**	**16.39**	**16.34**	**136,945**
F-16 Year 2013 Base Case Emissions	**(94.13)**	**(313.83)**	**(166.22)**	**(12.14)**	**(13.02)**	**(12.97)**	**(59,683)**
Scenario H5 Minus Base Case Emissions	**(22.77)**	**134.59**	**109.33**	**12.78**	**3.37**	**3.37**	**77,262**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Note: (Number) denotes a negative number.

In addition to presenting estimates of greenhouse gas emissions that would occur under the F-35A beddown scenarios at Holloman AFB, the following considers how climate change could impact the F-35A beddown scenarios at Holloman AFB and what adaptation strategies, if any, would be required to respond to these future conditions. For Holloman AFB, the main effect of climate change to consider is increased aridity, as documented in *Global Climate Change Impacts in the United States* (USGCRP 2009). This report predicts that in the future, the southwest will experience increased droughts, temperatures, wildfires, and scarcities of water supplies. Operations at Holloman AFB have adapted to droughts, high temperatures, and scarce water supplies. However, exacerbation of these conditions in the future would increase the cost of proposed operations at Holloman AFB and would impede operations during extreme events. Additional measures would be needed to mitigate these occurrences. Since brush and grassland plant communities border Holloman AFB and the proposed auxiliary airfields, an increase in wildfires in the region could interrupt proposed operations and could cause smoke obscurations from these events. Therefore, additional measures would be needed to protect infrastructure and personnel from increased wildfires.

HO 3.3.2 Airspace

HO 3.3.2.1 Airspace Affected Environment

Projected F-35A aircraft operations within auxiliary airfields, training areas, and aircraft flight routes between these locations and Holloman AFB would affect air quality within portions of New Mexico and Texas. These airspace units currently attain all of the NAAQS.

Requirements for Class I Areas. As part of the PSD Regulation, the Federal Clean Air Act provides special protection for air quality and air-quality-related values (including visibility and pollutant deposition) in selected areas of the United States (national parks greater than 6,000 acres or national wilderness areas greater than 5,000 acres). These Class I areas are areas where any appreciable deterioration of air quality is considered significant. In 1999, the EPA promulgated a regional haze regulation that requires states to establish goals and emission reduction strategies to make initial improvements in visibility within their respective Class I areas (EPA 1999). Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Portions of MTRs and airspace units proposed for use by the F-35A aircraft are in close proximity to pristine Class I areas in New Mexico and Texas including: (1) White Mountain Wilderness Area, (2) Bosque del Apache Wilderness Area (BAWA), (3) Gila Wilderness Area, (4) Salt Creek Wilderness Area, (5) Carlsbad Caverns National Park, and (6) Guadalupe Mountains National Park. Criteria to determine the significance of air quality impacts within Class I areas usually pertain to stationary emission sources, as mobile sources are generally exempt from permit review by regulatory agencies. However, Section 169A of the Clean Air Act states the Federal goal of prevention of any future impairment of visibility within Class I areas from manmade sources of air pollution. Therefore, due to the proximity of these pristine areas to projected aircraft operations, this EIS provides a qualitative analysis of the potential for projected emissions to affect visibility within these areas.

Table HO 3.3–14 presents an estimation of annual emissions due to F-16 aircraft operations within the Holloman AFB airspace units during the base case year of 2013. Because existing F-16 aircraft operations within the Beak MOA/ATCAA occur at least 3,000 feet AGL, no emissions are presented for these airspace units.

Table HO 3.3–14. Annual Emissions from F-16 Operations within Holloman AFB Airspace Units, 2013 Base Case

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Talon MOA/ATCAA - Low	0.33	0.12	4.16	0.13	0.14	0.14	443
R-5107 (Red Rio-WSMR)	0.40	0.15	5.12	0.17	0.18	0.18	546
R-5107 (Oscura-WSMR)	0.24	0.09	3.06	0.10	0.11	0.11	325
R-5107 (Lava E/W-WSMR)	0.25	0.09	3.19	0.10	0.11	0.11	340
R-5107 (Mesa L/H-WSMR)	0.30	0.11	3.80	0.12	0.13	0.13	405
R-5107 (Yonder-WSMR)	0.76	0.29	9.72	0.32	0.34	0.34	1,035
R-5103 (Centennial Range-Fort Bliss)	0.41	0.15	5.18	0.17	0.18	0.18	552
R-5103 (McGregor-Fort Bliss)	0.14	0.05	1.83	0.06	0.06	0.06	195
IR-133/142	0.45	0.17	5.74	0.19	0.20	0.20	611
IR-134/195	0.52	0.19	6.56	0.21	0.23	0.23	699
IR-192/194	1.12	0.42	14.21	0.46	0.49	0.49	1,514
RIAC	2.79	1.04	18.93	0.80	0.86	0.86	2,612
Total Existing Emissions	**7.70**	**2.88**	**81.50**	**2.83**	**3.02**	**3.02**	**9,277**

Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL.

HO 3.3.2.2 Airspace Environmental Consequences

Primary use airspace proposed for use by F-35A aircraft in New Mexico and Texas currently attains all of the NAAQS. Therefore, the analysis used the PSD threshold for new major sources of 250 tons per year as an indicator of significance for attainment pollutant emissions. If they exceed these levels, further analysis was conducted to determine whether impacts were significant. The analysis also evaluated how projected emissions would affect air quality within Federal Class I areas adjacent to these airspaces.

Operations

The air quality impact analysis of F-35A aircraft operations within the Holloman AFB primary use airspace is based upon the increase in emissions under Scenario H1W, H2W, or H3W or the change in emissions under Scenarios H1 through H5. The F-16 scenario starting point, or base case period, for comparison to F-35A operations is 2013.

Sources associated with the beddown of F-35A aircraft within the Holloman AFB primary use airspace and aircraft flight routes would include in-flight F-35A aircraft operations. Operational data used to calculate projected F-35A aircraft emissions were obtained from the Air Force (Air Force 2010b).

F-35A Scenarios H1W, H2W, and H3W. Table HO 3.3–15 summarizes the annual emissions that would occur under Scenarios H1W, H2W, and H3W within the Holloman AFB primary use airspace. Because proposed aircraft operations within the Beak MOA/ATCAA occur at least 3,000 feet AGL, no emissions are presented for this airspace unit. The data in Table HO 3.3–15 show that under Scenarios H1W and H2W, the increase in annual emissions from these actions would not exceed 250 tons per year. Therefore, these actions would result in less than significant air quality impacts on all NAAQS pollutant levels. The data in Table HO 3.3–15 show that under Scenario H3W, the increase in annual emissions, for all pollutants except NO_X would not exceed 250 tons per year. Therefore, this action would produce less than significant impacts on all NAAQS pollutant levels, with the possible exceptions of O_3 and NO_2.

Review of Table HO 3.3–15 shows that under Scenario H3W, F-35A aircraft operations within the Holloman AFB airspace units would increase NO_X emissions by a maximum of 289.9 tons per year. The F-35A aircraft would operate intermittently over a large region and depth of atmosphere that includes approximately 970 miles of aircraft training routes and 17,000 square miles of airspace. Therefore, NO_X emissions from these operations would be well-diluted when transported to ground level and they would not combine with the low ambient pollutant levels in the ROI to contribute to an exceedance of an NAAQS. As a result, F-35A operations under Scenario H3W would produce less than significant impacts on NAAQS pollutant levels.

Due to the presence of pristine Class I areas within the project region, F-35A emissions that occur within airspace units have the potential to impair visibility within these areas. The Class I area of most concern is the BAWA in central New Mexico, as it is only a few miles west of the borders of the Lava and Mesa airspace units. All other airspace units would occur at a sufficient distance and/or produce minimal F-35A operations such that they would produce inconsequential air quality impacts within the remaining Class I areas in the project region. Visibility impairment could occur from projected primary emissions of NO_2, SO_2, and PM_{10} or secondary formation of visibility-reducing particulate matter in the atmosphere due to precursor emissions of VOCs, NO_2, or SO_2. Visibility impairment from primary NO_2 emissions could occur as a brown-colored haze in the lower layer of the atmosphere. This situation usually would occur during the colder months of the year, when a lack of sunlight prevents the conversion of this pollutant to NO_X and oxygen. Visibility impairment due to primary PM_{10} emissions would occur in the form of plume blight or atmospheric discoloration from contrails. Visibility impairment due to the secondary formation of nitrate or sulfate particulates in the atmosphere from emissions of NO_X or SO_2 would usually occur in the warmer months of the year. This effect would take the form of regional haze, which would reduce regional visual range.

Table HO 3.3–15. Annual Emissions from Proposed F-35A Operations within Holloman AFB Airspace Units Under Scenarios H1W, H2W, and H3W

Year/Location	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Scenario H1W							
Airspace Units	0.01	0.86	48.59	2.07	0.22	0.22	6,750
Instrument Routes	0.00	0.55	30.87	1.31	0.14	0.14	4,288
RIAC	0.03	0.95	10.19	0.83	0.07	0.07	2,723
EPIA/Biggs AAF	0.02	0.59	7.07	0.55	0.05	0.05	1,798
Total Projected Emissions	**0.06**	**2.96**	**96.72**	**4.77**	**0.48**	**0.48**	**15,559**
Scenario H2W							
Airspace Units	0.01	1.73	97.18	4.14	0.44	0.44	13,500
Instrument Routes	0.01	1.10	61.74	2.63	0.28	0.28	8,576
RIAC	0.06	1.91	20.38	1.67	0.15	0.15	5,447
EPIA/Biggs AAF	0.04	1.18	14.15	1.10	0.10	0.10	3,595
Total Projected Emissions	**0.12**	**5.92**	**193.44**	**9.54**	**0.96**	**0.96**	**31,118**
Scenario H3W							
Airspace Units	0.02	2.59	145.77	6.21	0.66	0.66	20,250
Instrument Routes	0.01	1.65	92.61	3.94	0.42	0.42	12,865
RIAC	0.09	2.86	30.56	2.50	0.22	0.22	8,170
EPIA/Biggs AAF	0.05	1.77	21.22	1.65	0.14	0.14	5,393
Total Projected Emissions	**0.18**	**8.87**	**289.85**	**14.30**	**1.43**	**1.43**	**46,634**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL.

F-35A aircraft operations under Scenarios H1W, H2W, and H3W would increase NO_X emissions by a maximum of 44.4 tons per year within the Lava and Mesa airspace units (Scenario H3W). The area of these two airspace units encompasses about 1,700 square miles. Most of these NO_X emission increases would occur more than 20 miles away from the BAWA in the northeastern and southeastern portions of these airspace units. During periods when winds would transport F-35A emissions from these airspace units to the BAWA, the dispersion associated with such a long travel distance would substantially dilute their concentrations upon arrival in the BAWA. As a result, F-35A operations adjacent to the BAWA would not substantially contribute to visibility impairment within this pristine area. Therefore, F-35A operations under Scenario H1W, H2W, or H3W would produce less than significant contributions to visibility impairment within Class I areas in the project region.

F-35A Scenarios H1, H2, H3, H4, and H5. Table HO 3.3–16 summarizes the annual emissions that would occur under Scenarios H1 through H5 within the Holloman AFB airspace units. Because proposed aircraft operations within the Beak MOA/ATCAA occur at least 3,000 feet AGL, no emissions are presented for this airspace unit. The data in Table HO 3.3–16 show that, with the addition of 24 to 72 F-35A aircraft, the increase in annual emissions from these actions would not exceed 250 tons per year. Therefore, these actions would result in less than significant air quality impacts on all NAAQS pollutant levels. The data in Table HO 3.3–16 also show that with the addition of 96 or 120 F-35A aircraft, the increase in annual emissions from these actions, for all pollutants except NO_X, would not exceed 250 tons per year. Therefore, these actions would produce less than significant impacts on all NAAQS pollutant levels, with the possible exceptions of O_3 and NO_2.

Review of Table HO 3.3–16 shows that under Scenario H5, the F-35A aircraft operations would increase NO_X emissions by a maximum of 406.7 tons per year. The F-35A aircraft would operate intermittently over a large region and depth of atmosphere that includes approximately 970 miles of aircraft training routes and 17,000 square miles of airspace. Therefore, NO_X emissions from these operations would be well-diluted when transported to ground level and they would not combine with the low ambient pollutant levels in the ROI to contribute to an exceedance of an NAAQS. As a result, F-35A operations under Scenario H1, H2, H3, H4, or H5 would produce less than significant impacts on NAAQS pollutant levels.

Under Scenario H5, F-35A aircraft operations would increase NO_X emissions by a maximum of 82.9 tons per year within the Lava and Mesa airspace units. Similar to the effects described for Scenario H3W, most of these NO_X emission increases would occur more than 20 miles away from the BAWA in the northeastern and southeastern portions of these airspace units. During periods when winds would transport F-35A emissions from these airspace units to the BAWA, the dispersion associated with such a long travel distance would substantially dilute their concentrations upon arrival in the BAWA. As a result, F-35A operations adjacent to the BAWA would not substantially contribute to visibility impairment within this pristine area or any other Class I area in the project region.

Table HO 3.3–16. Annual Emissions from Proposed F-35A Operations within Holloman AFB Airspace Units Under Scenarios H1, H2, H3, H4, and H5

Year/Location	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Scenario H1							
Airspace Units	0.01	0.72	40.53	1.73	0.18	0.18	5,630
Instrument Routes	0.00	0.55	30.87	1.31	0.14	0.14	4,288
RIAC	0.03	0.95	10.19	0.83	0.07	0.07	2,723
EPIA/Biggs AAF	0.02	0.59	7.07	0.55	0.05	0.05	1,798
Total Projected Emissions	**0.06**	**2.82**	**88.66**	**4.43**	**0.44**	**0.44**	**14,439**
Total - F-16 Reductions	**(7.70)**	**(2.88)**	**(81.50)**	**(2.83)**	**(3.02)**	**(3.02)**	**(9,277)**
Net Change	**(7.65)**	**(0.07)**	**7.16**	**1.60**	**(2.58)**	**(2.58)**	**5,162**
Scenario H2							
Airspace Units	0.01	1.83	102.62	4.37	0.46	0.46	14,256
Instrument Routes	0.01	1.10	61.74	2.63	0.28	0.28	8,576
RIAC	0.06	1.91	20.38	1.67	0.15	0.15	5,447
EPIA/Biggs AAF	0.04	1.18	14.15	1.10	0.10	0.10	3,595
Total Projected Emissions	**0.12**	**6.01**	**198.88**	**9.77**	**0.98**	**0.98**	**31,874**
Total - F-16 Reductions	**(7.70)**	**(2.88)**	**(81.50)**	**(2.83)**	**(3.02)**	**(3.02)**	**(9,277)**
Net Change	**(7.59)**	**3.13**	**117.38**	**6.94**	**(2.04)**	**(2.04)**	**22,597**
Scenario H3							
Airspace Units	0.02	2.16	121.53	5.18	0.55	0.55	16,883
Instrument Routes	0.01	1.64	92.30	3.93	0.42	0.42	12,822
RIAC	0.09	2.86	30.56	2.50	0.22	0.22	8,170
EPIA/Biggs AAF	0.05	1.77	21.22	1.65	0.14	0.14	5,393
Total Projected Emissions	**0.17**	**8.44**	**265.62**	**13.26**	**1.32**	**1.32**	**43,268**
Total - F-16 Reductions	**(7.70)**	**(2.88)**	**(81.50)**	**(2.83)**	**(3.02)**	**(3.02)**	**(9,277)**
Net Change	**(7.53)**	**5.56**	**184.12**	**10.44**	**(1.70)**	**(1.70)**	**33,991**

Year/Location	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e}
Scenario H4							
Airspace Units	0.02	2.88	162.04	6.90	0.73	0.73	22,510
Instrument Routes	0.02	2.19	123.17	5.24	0.55	0.55	17,110
RIAC	0.12	3.82	40.75	3.34	0.29	0.29	10,893
EPIA/Biggs AAF	0.07	2.36	28.30	2.20	0.19	0.19	7,191
Total Projected Emissions	0.23	11.25	354.25	17.69	1.77	1.77	57,704
Total - F-16 Reductions	(7.70)	(2.88)	(81.50)	(2.83)	(3.02)	(3.02)	(9,277)
Net Change	(7.47)	8.37	272.76	14.86	(1.26)	(1.26)	48,427
Scenario H5							
Airspace Units	0.03	4.41	247.83	10.55	1.11	1.11	34,428
Instrument Routes	0.02	2.74	154.04	6.56	0.69	0.69	21,398
RIAC	0.15	4.77	50.94	4.17	0.36	0.36	13,616
EPIA/Biggs AAF	0.09	2.95	35.37	2.76	0.24	0.24	8,989
Total Projected Emissions	**0.29**	**14.87**	**488.17**	**24.04**	**2.41**	**2.41**	**78,431**
Total - F-16 Reductions	**(7.70)**	**(2.88)**	**(81.50)**	**(2.83)**	**(3.02)**	**(3.02)**	**(9,277)**
Net Change	**(7.41)**	**11.99**	**406.68**	**21.21**	**(0.61)**	**(0.61)**	**69,154**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**N/A**

Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL; (Number) denotes a negative number.

HO 3.4 Safety

HO 3.4.1 Base

HO 3.4.1.1 Base Affected Environment

Ground Safety

Ground safety includes many categories (Air Force Instruction [AFI] 91-204) consisting of ground and industrial operations, operational and occupational safety hazards, motor vehicles use, off-duty military and maritime activities, and fire. Ground mishaps can occur on ground or water, on or off an installation, and may involve Air Force personnel, contractors, and property losses. They can occur in a work environment from the use of equipment or materials, including administrative, supply, custodial, and maintenance for Air Force functions. Day-to-day construction operations under each of the proposed scenarios are required to be performed in accordance with all applicable Air Force safety regulations; published Air Force technical orders; and Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) requirements. On-base construction and demolition activities are required to have an appropriate job site safety plan, which would explain how tasks would be accomplished while assuring job safety throughout the life of the project. Construction and demolition workers are also required to follow applicable Occupational Safety and Health Administration (OSHA) requirements. Occupational health and safety would be governed by the terms of the contract, which may incorporate Air Force regulations and technical orders, AFOSH standards, and OSHA standards. Additionally, Holloman AFB fire and emergency services meet all established Air Force staffing and equipment standards.

Anti-Terrorism/Force Protection (AT/FP). Anti-Terrorism/Force Protection (AT/FP) is a security program designed to protect Air Force active-duty personnel, civilian employees, family members, and facilities and equipment in all locations and situations. The program is accomplished through the planned and integrated application of anti-terrorism measures, physical security, operations security, and personal protective services. It is supported by intelligence, counterintelligence, and other security programs. In response to terrorist attacks, several regulations have been promulgated to ensure that force protection standards are incorporated into the planning, programming, and budgeting for the design and construction of military construction-funded facilities. *DoD Minimum Antiterrorism Standards for Buildings* (UFC 04-010-01) (DoD 2003), published in 2003 and updated in 2007, establishes minimum standoff distances that must be maintained between several categories of structures and areas that are relatively accessible to terrorists.

The intent of this siting and design guidance is to improve security, minimize fatalities, and limit damage to facilities in the event of a terrorist attack. Many military installations, such as Holloman AFB, were developed before AT/FP considerations became a critical concern. Thus, under current conditions, many installations are not able to comply with all present AT/FP standards. However, as new construction occurs, these standards would be incorporated into the design, and as facilities are modified, AT/FP standards would be incorporated to the maximum extent practicable.

Airfield Safety

Holloman AFB is located at 32° 51′06″ north and 106° 06′ 30″ west, with a field elevation of 4,093 feet MSL. The airfield consists of three runways (two intersecting) oriented on magnetic bearings of 38.8° for Runway 4 and 218.8° for Runway 22 (northeast to southwest), 70.5° for Runway 07 and 250.5° for Runway 25 (east to west), and 338.8° for Runway 34 and 158.8° for Runway 16 (north to south). All runways at Holloman AFB are composed of Porous European Mix (PEM), a variety of asphalt, and have high-intensity runway edge lights with standard 2,400-foot high-intensity approach lights with centerline-sequenced flashers (AirNav 2010; FAA 2010a).

Runway 4/22 is 10,575 feet long by 300 feet wide, and runway elevation slopes upward from 4,056 feet MSL at the Runway 4 end to 4,083 feet MSL at the Runway 22 end (a 0.3 percent slope). Runway 4/22 is concrete for the first 1,000 feet on either side, with asphalt composing the middle 8,575 feet. Runway 16/34 is 12,131 feet long by 150 feet wide, and runway elevation slopes upward from 4,049 feet MSL at the Runway 34 end to 4,084 feet MSL at the Runway 16 end (a 0.3 percent slope). The first 1,850 feet of Runway 34 is concrete as is the first 1,700 feet of Runway 16; the middle 8,851 feet of Runway 16/34 is asphalt. Runway 7/25 is 12,917 feet long by 150 feet wide, and runway elevation slopes upward from 4,051 feet MSL at the Runway 7 end to 4,093 feet MSL at the Runway 25 end (a 0.4 percent slope). The first 1,000 feet of Runway 25 is concrete; the remainder is asphalt (AirNav 2010).

Multiple taxiways are located on Holloman AFB, including Taxiways A and H, which provide access from hangars to Runway 34; Taxiways B, C, and F, which provide access from hangars to Runway 25; and Taxiways D and E, which provide access to Runway 22.

Airspace at Holloman AFB is managed in accordance with AFI 13-201, *Air Force Airspace Management* (Air Force 2006), which implements Air Force Planning Document 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management* (Air Force 2007), and DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation and National Airspace System Matters* (DoD 1997).

Class D airspace around Holloman AFB extends from the surface up to and including 6,600 feet MSL, within a 4.8-statute-mile radius of Holloman AFB; however, this excludes airspace within a 2-statute-mile radius of the Alamogordo-White Sands Regional Airport, which is located approximately 5 NM east of Holloman AFB.

FAA's Albuquerque ARTCC is responsible for the airspace in the vicinity of Holloman AFB. Albuquerque ARTCC controls airspace in large portions of New Mexico and Arizona and smaller sections of Texas, Oklahoma, and Colorado. Fort Worth ARTCC is responsible for airspace just to the east of Holloman AFB, and Denver ARTCC controls airspace to the north. Responsibility for the management of air traffic at Holloman AFB has been delegated to Holloman Approach Control (Air Force 2009a).

Accident potential relies on identifying where most accidents have occurred in the past at military airfields (Air Force 1972). This approach does not produce accident probability statistics because the question of probability involves too many variables for an accurate prediction model to be developed. Rather, the analysis of military aircraft accident history focuses on determining where, within the airfield environments an accident is likely to occur, and how large an impact area is likely to result from any single accident. As per DoD Instruction 4165.57, *Air Installations Compatible Use Zones* (DoD 1977), Holloman AFB has established the following zones to ensure compatible land use and safety in and around the airfield environment: Clear Zone (CZ), Accident Potential Zone (APZ) I, and APZ II. To this end, an expanded CZ and two APZs have been designated at each end of military runways (see Figure HO 3.4–1).

Clear Zones. CZs at Holloman are rectangular areas 3,000 feet long by 3,000 feet wide occurring at each end of the three runways. These are the areas with the highest statistical potential for aircraft accidents. The overall risk is so high that the DoD generally acquires this land through purchase or easement to prevent development. All land within the CZs is contained within the boundary of Holloman AFB, with the exception of a portion of the CZ for Runway 04/22, which is contained within the boundary of WSMR (Holloman AFB 2004b).

APZ I. APZ I at Holloman AFB consists of an area 3,000 feet wide by 5,000 feet long adjacent to each CZ. The potential for aircraft accidents is statistically less critical within APZ I than within the CZ, but it is still substantial. APZ I for Runway 25 is partially contained within the boundary of WHSA and portions of APZ I for Runway 7 and Runway 16 are contained within Alamogordo city limits (Holloman AFB 2004b).

APZ II. APZ II at Holloman AFB consists of an area 3,000 feet wide by 7,000 feet long adjacent to each APZ I. APZ II possesses a lower statistical potential for aircraft accidents than CZ or APZ I, but a risk of aircraft accident is still present. All of APZ II for Runway 7 and Runway 16 is found within Alamogordo city limits; all of APZ II for Runway 25 and a small portion of Runway 22 are within the boundary of WHSA (Holloman AFB 2004b).

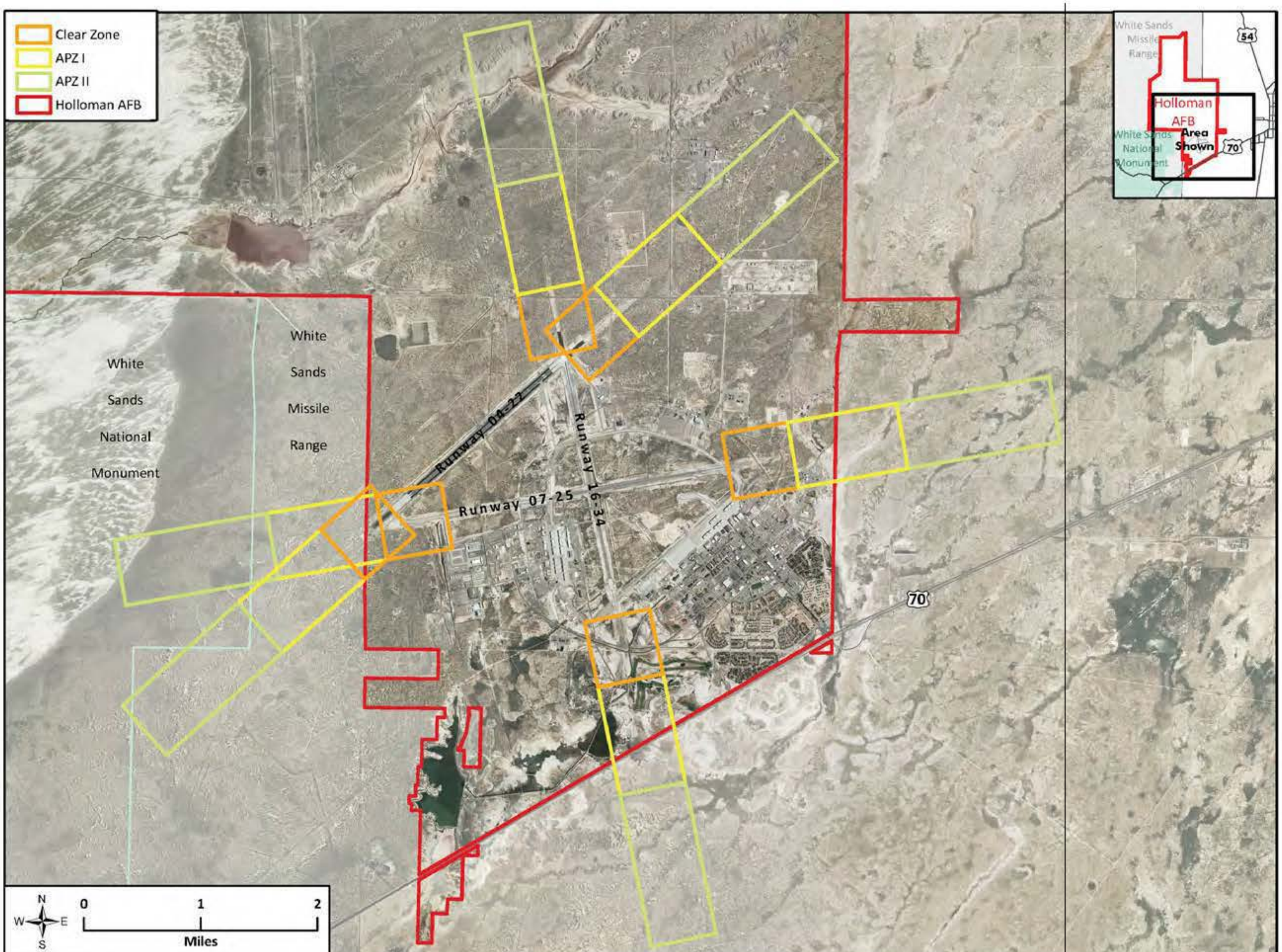


Figure HO 3.4–1. Accident Potential Zones at Holloman AFB

Ground Obstructions. All structures on the ground have the potential to create hazards to flight. The FAA provides detailed instructions for the marking of obstructions (i.e., paint schemes and lighting) to warn pilots of their presence. Any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 feet (61 meters) AGL or exceeds any obstruction standard contained in Title 14 of the *Code of Federal Regulations* (CFR), Part 77, "Objects Affecting Navigable Airspace," should normally be marked and/or lighted. The FAA may also recommend marking and/or lighting a structure that does not exceed 200 feet AGL or 14 CFR Part 77 standards because of its particular location (FAA 2007). The obstruction standards in 14 CFR Part 77 are primarily focused on structures in the immediate vicinity of airports and approach and departure corridors from airports (14 CFR 77).

Aircraft Mishaps. The primary public concern with regard to flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of weather-related accidents, mechanical failure, pilot error, mid-air collisions, collisions with manmade structures or terrain, or bird-aircraft collisions. Flight risks apply to all aircraft; they are not limited to the military.

The Air Force defines four major categories of aircraft mishaps, which are defined in Chapter 3, Section 3.4. This EIS focuses on Class A mishaps because of their potentially catastrophic results.

Mishap rates are statistically assessed as an occurrence rate per 100,000 flying hours. Table HO 3.4–1 reflects the cumulative annual Class A mishap rates of the F-15, F/RF-4, F-117, T-38, and F-16 for the periods for which accident records have been established. These Air Force aircraft have been or are currently based at Holloman AFB. The F-22 was the newest aircraft based at Holloman AFB, and has not yet flown 100,000 flight hours to establish an official Class A mishap rate; therefore, the rate is based on the number of hours flown to date. The F-22 has a higher accident rate than the other aircraft due to its shorter history and lower amount of recorded flight hours (approximately 94,000 hours). The F-35A does not have enough flight hours to estimate a Class A mishap rate.

Table HO 3.4–1. Class A Accident History

Aircraft	*Reporting Period*	*Accident Rate per 100,000 Hours*	*Lifetime Hours Flown*
F-22[1]	FY02–FY10	6.35	94,519
F-15	CY72–FY10	1.85	5,907,793
F/RF-4	FY71–FY00	4.64	7,604,757
F-117	FY91–FY08	3.21	218,191
T-38	CY60–FY10	1.47	13,734,629
F-16	CY75-FY10	3.61	9,462,699

[1] Based on actual hours; the F-22 has not reached 100,000 flight hours as of the date of this publication.
Source: AFSC 2010a.

Bird/Wildlife–Aircraft Strike Hazards (BASH). Bird–aircraft strikes constitute a safety concern for the Air Force because of the potential for damage to aircraft or injury to aircrews or local human populations if an aircraft crash occurs in a populated area. Aircraft may encounter birds at altitudes of 30,000 feet MSL or higher. However, most birds fly close to the ground. More than 97 percent of reported bird strikes occur below 3,000 feet AGL. Approximately 30 percent of bird strikes happen in the airport environment, and almost 55 percent occur during

low-altitude flight training (AFSC 2010b). A minimal BASH exists at Holloman AFB and its vicinity due to low populations of resident and migratory species and their distribution patterns.

Migratory waterfowl (e.g., ducks, geese, and swans) are the most hazardous birds to low-flying aircraft because of their size and their propensity for migrating in large flocks at a variety of elevations and times of day. Waterfowl vary considerably in size, from 1 to 2 pounds for ducks, 5 to 8 pounds for geese, and up to 20 pounds for most swans. There are two normal migratory seasons, fall and spring. Waterfowl are usually only a hazard during migratory seasons. These birds typically migrate at night and generally fly between 1,000 and 2,500 feet AGL during migration. Holloman AFB is located within a minor migration corridor in the Central Flyway. The most common species of migratory birds are mallard, northern pintail, blue-winged teal, northern shoveler, and Wilson's phalarope. In the proximity of the migratory flyway and the Lake Holloman Wildlife Refuge Area is a complex of small lakes, constructed wetlands, and playas southwest of Runway 34, which contributes to potential bird strikes. The complex, which primarily serves as storage for treated sewage from the base's wastewater treatment plant, provides some of the only permanent water in the vicinity of the base and attracts primarily waterfowl and shorebirds. The local waters sustain low-breeding populations, but support substantial migratory populations of waterfowl and shorebirds. Local flying procedures avoid direct overflight of these areas.

Explosives Safety

Department of Defense Explosives Safety Board (DDESB) Standard 6055.9, *DoD Ammunition and Explosives Safety Standards* (DoD 2004), and Air Force Manual 91-201, *Explosives Safety Standards* (Air Force 2011b), represent DoD and Air Force guidelines for complying with explosives safety. These regulations, as well as AFI 91-204, *Safety Investigations and Reports* (Air Force 2008), identify explosives safety mishaps involved in both explosive and chemical agents. Explosives include ammunition, propellants (solid and liquid), pyrotechnics, warheads, explosive devices, and chemical agent substances and associated components that present real or potential hazards to life, property, or the environment.

Siting requirements for munitions and ammunition storage and handling facilities are based on safety and security criteria. Defined distances are maintained between munitions storage areas and a variety of other types of facilities. These distances, defined by quantity-distance (Q-D) arcs, vary in size depending on the type and quantity of explosive material to be stored. Each explosive material storage or handling facility has Q-D arcs extending outward from its sides and corners for a prescribed distance. Within these Q-D arcs, development is either restricted or prohibited altogether to ensure safety of personnel and minimize potential for damage to other facilities in the event of an accident. In addition, explosives storage and handling facilities must be located in areas where security of the munitions can be maintained at all times. Identifying the Q-D arcs ensures that construction does not occur within these areas.

Holloman AFB controls, maintains, and stores all ordnance and munitions required for mission performance in accordance with Air Force and DDESB safety procedures. All munitions maintenance is carried out by trained, qualified personnel using Air Force–approved technical data for the specific type of ordnance. Ample storage facilities exist, and all facilities are fully certified for the ordnance they store. However, in the past, some storage magazines near the

munitions storage area fence line have been limited to storing less than their designed Net Explosive Weights due to Q-D arc concerns. These restrictions have not impacted operations at Holloman AFB because sufficient storage is available in other magazines within the munitions storage area. The Air Force imposes procedures for arming and de-arming munitions and ordnance. All such activities occur on defined arm/de-arm pads. An arm/de-arm pad is located at the end of each runway and at the specified distance for safety away from incompatible land uses. Air Force and DDESB safety procedures require safeguards on weapons systems and ordnance that ensure against inadvertent releases.

Both live and inert munitions are stored and handled at Holloman AFB. Inert training ordnance accounts for the vast majority of training materials. Trained, qualified personnel using Air Force–approved technical data carry out all munitions maintenance and aircraft loading. All storage facilities are approved for the specific ordnance involved.

Lasers are not explosives, and lasers are employed by current training aircraft at WSMR for very accurate targeting of ordnance. Lasers can be set in eye-safe mode for such training as urban combat. Existing range targets used for training with lasers not set in eye-safe mode are specifically cleared for such training and treated as inert munitions ranges. WSMR and associated ranges have targets designated for laser targeting systems that are currently used by MQ-1, MQ-9, and other military aircraft.

HO 3.4.1.2 Base Environmental Consequences

Ground Safety

No aspect of the various F-35A aircraft basing scenarios for Holloman AFB that are expected to create new or unique ground safety issues. Operations and maintenance procedures conducted by base personnel would not change from current conditions. All activities would continue to be conducted in accordance with applicable regulations, technical orders, and AFOSH standards. Holloman AFB controls, maintains, and stores all ordnance and munitions required for mission performance in accordance with Air Force and DDESB safety procedures. All munitions maintenance is carried out by trained and qualified personnel using Air Force–approved technical data for the specific type of ordnance. The Air Force imposes procedures for arming and de-arming munitions and ordnance. All such activities occur on defined arm/de-arm pads. An arm/de-arm pad is located at specified distances away from incompatible land uses for safety standards compliance. The Air Force and DDESB procedures require safeguards on weapons systems and ordnance that ensure against inadvertent releases.

All renovation and construction activities would comply with all applicable OSHA regulations to protect workers. In addition, the newly constructed buildings would be built in compliance with AT/FP requirements and outside any identified Q-D arcs for explosives safety. The Air Force does not anticipate any significant safety impacts as a result of construction, demolition, or renovation if all applicable AFOSH and OSHA requirement are implemented.

Airfield Safety

The Class A rate is not yet determined for the F-35A, and as with any new aircraft, there are always elements of a new system that require testing and evaluation. Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location. Although the F-35A is a relatively new type of aircraft, historical trends show that mishaps of all types decrease the longer an aircraft is operational as flight crews and maintenance personnel learn more about the aircraft's capabilities and limitations. As the F-35A becomes more operationally mature, the aircraft mishap rate is expected to become comparable with a similarly sized aircraft with a similar mission. The F-35A would operate in an airfield environment similar to the current operational environment. Since the F-35A is a new airframe and would require response actions specific to the aircraft, the emergency and mishap response plans should be updated to include procedures and response actions necessary to address a mishap involving the F-35A and associated equipment. With these updates, the Holloman AFB airfield safety conditions would be similar to existing conditions. Therefore, no significant impact would occur from aircraft mishaps or mishap response.

Capability for fire response is located on base and in the impacted communities. The base Fire Department is party to mutual aid support agreements with the nearby communities. These functions would continue to occur as they have under current conditions.

Proposed construction, renovation, and infrastructure-improvement projects related to the F-35A aircraft scenarios would be consistent with established APZs. Therefore, construction activity and subsequent operations within new or renovated structures would not result in any greater safety risk, and no significant impact related to APZs would occur.

Explosives Safety

The proposed project area does not fall within an established Q-D arc, and proposed construction, renovation, and infrastructure-improvement projects related to the F-35A aircraft scenarios would be consistent with established Q-D arcs. Therefore, construction activity and subsequent operations would not result in any greater safety risk.

Ordnance used by the F-35A would be similar to that associated with current aircraft based at Holloman AFB. Ordnance is handled and stored in accordance with Air Force and DDESB explosive safety directives, and all ordnance handling is carried out by trained, qualified personnel. Ordnance and laser training would use approved targets, including targets on WSMR and associated ranges, and such training would be comparable to existing ordnance and laser training. Therefore, munitions handling, ordnance use, or laser training would not result in any greater safety risk, and no significant impact related to explosives or laser training safety would occur.

HO 3.4.2 Airspace

HO 3.4.2.1 Airspace Affected Environment

Figure HO 2.2–1 shows the primary and occasional use airspace units and MTRs that the F-35A would use for flight training. Each of the MOAs listed has overlying ATCAAs that provide the higher altitudes needed for flight maneuvers above the MOA ceilings. The Talon MOAs and Beak MOAs are owned by 49 WG at Holloman AFB. The Pecos MOAs are owned and scheduled by 27th Special Operations Wing at Cannon AFB (see Tables HO 2.2–1 and HO 2.2–2). The ATCAA airspace units overlying MOAs are scheduled and managed by Albuquerque ARTCC. Restricted Areas overlie the air-to-ground ranges at WSMR and Fort Bliss. These Restricted Areas are owned and scheduled by each respective agency. Cooperative scheduling of this airspace by 49 WG, Fort Bliss, WSMR, and Albuquerque ARTCC has ensured the needs of all airspace users are accommodated. In addition to the F-16s, Tornadoes, and other aircraft based at Holloman AFB, daily users of these airspace units include the various test missions at WSMR. Table HO 2.2–1 shows sortie-operations in the primary use airspace units under Scenarios H1W, H2W, and H3W, and Table HO 2.2–2 shows airspace utilization under Scenarios H1 through H5.

Auxiliary Airfields

Biggs AAF, EPIA, and RIAC are proposed as auxiliary airfields for F-35A aircraft based at Holloman AFB. Table HO 2.2–6 shows the number of airfield operations proposed at the three airfields under each beddown scenario. The number of operations conducted at Biggs AAF and EPIA would not differ between F-35A scenarios since the F-16 does not currently conduct operations at these airfields. The number of operations conducted at RIAC would differ between the F-35A aircraft scenarios. These outlying airfields/airports are discussed below.

Biggs AAF. Fort Bliss' Biggs AAF, adjacent to EPIA, has more miles of runway than any other Army airfield in the world. It also ranks as the Nation's tenth largest runway, including commercial airports.

Biggs AAF is used for major interservice exercises, such as Gallant Eagle and Border Star, as well as Air Force readiness tests. In addition, many active-duty and reserve units deploy to Biggs AAF to conduct desert training in the Fort Bliss area.

The airfield is situated on approximately 4,000 acres and is enclosed by a chain-link fence 12.5 miles in length. The runway is 13,572 feet long, 300 feet wide, has a concrete surface, and is capable of handling B-52 and C-5 traffic. There are 1,000 feet of asphalt overrun at each end and approximately 7.7 miles of taxiways. The airfield has two major areas with concrete surfaces. The largest single area is 800,000 square feet. An additional nine concrete pads (90 feet × 200 feet) are used for parking. Parking aprons cover a total of 2.9 million square feet, with asphalt surface. Due to the proximity of U.S. Route 375, arming of aircraft weapon systems on Biggs AAF is prohibited.

Rotary-wing aircraft normally use the east–west taxiways but may use any taxiway or any other location approved by Biggs Tower. Instrument takeoffs normally depart from the lighted helipad on Taxiway B. The primary maintenance test flight hover area is north of Taxiway B,

east of Taxiway F, west of Taxiway C, and south of the sod area. Taxiway B may also be used between Taxiway F and Taxiway C. The use of the Biggs AAF main runway for maintenance and emergency procedure training is prohibited.

To participate with the El Paso Class C airspace requirement and to assist in the Biggs AAF noise abatement program, all tenant aircraft intending to fly to Kilbourne Hole or other destinations to the west are requested to travel via Anthony Gap. Transient aircraft, especially medium- and heavy-lift helicopters (i.e., AH-64, CH-47, H-3, CH-46, and CH-53), are requested to fly at least 1,500 feet AGL on a track around the city of El Paso. To reduce noise complaints in Chaparral, New Mexico, the minimum overflight altitude is 5,000 feet MSL.

Ranges and training areas lie to the northwest and northeast of the main post cantonment areas of the Fort Bliss Military Reservation. The Doña Ana ranges and maneuver areas 3a through 7d are within R-5107A. The McGregor ranges and maneuver areas 9 through 32 are within R-5103A. A Visual Flight Rule (VFR) corridor exists between these two Restricted Areas following the railroad from El Paso, Texas, to Alamogordo, New Mexico. The corridor extends 2 miles west of and parallel to the railroad. Northeast-bound rotary-wing aircraft should fly at 4,500 feet MSL over the railroad (mission permitting). Southwest-bound rotary-wing aircraft normally fly at 4,500 feet MSL 1 mile west of the railroad.

EPIA. EPIA covers 6,800 acres (2,752 hectares) and has three runways, as follows:

- Runway 4/22: 12,020 × 150 feet (3,664 × 46 meters), Surface: asphalt
- Runway 8R/26L: 9,025 × 150 feet (2,751 × 46 meters), Surface: asphalt
- Runway 8L/26R: 5,493 × 75 feet (1,674 × 23 meters), Surface: asphalt

The airport had a total passenger loading of 1,493,212 during calendar year 2010 (EPIA 2010).

RIAC. RIAC Airport covers an area of 5,029 acres (2,035 hectares) and has three paved runways, as follows:

- Runway 3/21: 13,001 × 150 feet (3,963 × 46 meters), Surface: asphalt/concrete
- Runway 12/30: 7,425 × 200 feet (2,263 × 61 meters), Surface: asphalt/concrete
- Runway 17/35: 9,999 × 100 feet (3,048 × 30 meters), Surface: asphalt

For the 12-month period ending October 31, 2007, the airport had 43,990 aircraft operations, an average of 120 per day: 51 percent were general aviation, 31 percent were military, 18 percent were air taxi, and less than 1 percent was scheduled commercial. At that time, there were 46 aircraft based at this airport: 76 percent were single-engine, 17 were percent multi-engine, 4 percent were jet, and 2 percent were helicopter.

HO 3.4.2.2 Airspace Environmental Consequences

Aircraft Mishaps. The potential to accommodate a maximum of 120 F-35A PAA would result in F-35A operations similar to those currently ongoing at Holloman AFB. The F-35A would use the existing airspace, including MOAs, ATCAAs, restricted airspace, MTRs, and low-level routes, under the same procedures as currently exist. This would not result in any increase in

the safety risks associated with aircraft mishaps or any increase in the risks of occurrence of those mishaps.

The F-35A is capable of dumping fuel during emergencies. The FAA sets requirements for when and how fuel dumping may occur. This instruction stipulates that fuel can only be dumped above a minimum altitude of 2,000 feet to improve its evaporation, and that a dumping aircraft must be separated from other air traffic by at least 5 miles. Air traffic controllers are also instructed to direct planes dumping fuel away from populated areas and over large bodies of water as much as possible. The same guidelines apply to military aircraft; air bases only permit fuel dumping in a specified area (FAA 2010b).

The wake turbulence behind the aircraft makes most of the fuel released vaporize into a fine mist, which remains in the atmosphere until being broken down by the sun's energy into carbon dioxide and water. Studies of the behavior of dumped fuels have been conducted using kerosene, of which the Jet Propellant-8 fuel that powers the F-35A is a derivative (FAA 2009). Only a minimal amount of the dumped kerosene actually reaches the ground. If a fuel dump is made at the minimum altitude of 4,921 feet, given a ground temperature of 59 °F and assuming that the air is still, it is calculated that 8 percent of the total fuel dumped will reach the ground. Assuming the aircraft is flying at the minimum speed of 300 miles per hour, this results in the ground being affected by 2.09 ounces of kerosene spread over an area of 1,000 cubic yards (FAA 2009). This assumes total stillness of the air, which is highly unlikely. Even the slightest air movements make fuel evaporate almost entirely before it can reach the ground. In 2001, the EPA National Vehicle and Fuel Emissions Laboratory concluded, "Since fuel dumping is a rare event, and the fuel would likely be dispersed over a very large area, we believe its impact to the environment would not be serious" (EPA 2001).

Flare Use. As described in Chapter 2, Section 2.4.5, and in Section HO 2.2.2, the F-35A would use MJU-61/B defensive flares. These flares are similar to the flare types used by legacy aircraft such as the F-16s. Flares would only be used in airspace units approved for flare use and within authorized altitudes. For Holloman AFB, the standard minimum altitude for flares is 2,000 feet AGL. Flares typically burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flare burnout before a flare reaches the ground or water under the training airspace. Holloman AFB does restrict flare use during high or extreme fire danger to minimize the risk of wildland fires. Air Force Instructions (AFIs) are issued for each base to establish restrictions on flare deployment. Typically, these AFIs designate airspace managers or range controllers with the responsibility to identify and publicize the fire conditions and specify minimum altitudes for flare use. Fire category restrictions are established for the use of flares, and aircrews are responsible to know the fire code and associated restrictions. Aircrews are briefed on fire conditions prior to a mission, and, if in doubt, the AFIs specifically state an "aircrew will not dispense flares anywhere in the impact area or MOA without positive confirmation that flare use is authorized." Airspace managers or range controllers apply a decision matrix that takes into consideration the fire danger assigned by the U.S. Forest Service to the forests, such as high, very high or extreme, fuel load on the ranges, recent rainfall, humidity, winds, etc. Based on fire danger conditions, use of flares in specific airspaces can change on a daily basis.

On extremely rare occasions (estimated at approximately 0.01 percent of flares dispensed), a flare may not ignite and would fall to the earth as a dud flare. In an extremely rare occasion, where a dud flare is found, it should not be moved, the location should be identified, and the Air Force base public affairs office or the local fire department should be contacted and provided with the dud flare location.

The residual materials for flares, including the MJU-61/B, are described in detail in Chapter 2, Section 2.4.5. All of the MJU-61/B residual flare materials that fall have surface area to weight ratios that would not produce any substantial impact when the residual flare material struck the ground. The largest item is the 0.975 inch × 0.975 inch × 0.5 inch plastic and spring igniter device with a weight of approximately 0.33 ounces in the MJU-61/B flare. This igniter device would strike the ground with a momentum of 0.046 lb-sec, or approximately the same force as a small hailstone, which would be noticed if it struck a person, but would not be expected to bruise. Additionally, the likelihood of a strike is remote given the areal extent of the airspace, the population density beneath the airspace, and the proportion of time a person is expected to be outside. Therefore, no significant impacts on safety from flare residual materials are expected.

BASH. A BASH exists at Holloman AFB and its vicinity due to resident and migratory bird species and other wildlife. Daily and seasonal bird movements create various hazardous conditions. To address the issues of bird–aircraft strikes, the Air Force has developed the Avian Hazard Advisory System to monitor bird activity and forecast bird strike risks. Using Next Generation Radar (NEXRAD) weather radars and models developed to predict bird movement, the Avian Hazard Advisory System is an online, near–real-time geographic information system (GIS) used for bird strike risk flight planning across the contiguous United States and Alaska.

Additionally, as part of an overall strategy to reduce BASH risks, the Air Force has developed a Bird Avoidance Model using GIS technology as a key tool for analysis and correlation of bird habitat, migration, and breeding characteristics and is combined with key environmental and manmade geospatial data. The model was created to provide Air Force pilots and flight schedulers/planners with a tool for making informed decisions when selecting flight routes. The model was created in an effort to protect human lives, wildlife, and equipment during air operations. This information is integrated into required Pilot briefings, which take place prior to any sortie.

Holloman AFB has an ongoing BASH Program. Since future aircraft flight operations will remain similar to those currently experienced at Holloman AFB, the overall potential for bird/wildlife–aircraft strikes is not anticipated to be significantly greater than current levels. F-35A aircrews operating in Holloman AFB airspace would be required to continue the applicable procedures outlined in the Holloman BASH Plan. Holloman AFB personnel developed aggressive procedures designed to minimize the occurrence of bird/wildlife–aircraft strikes, and have documented detailed procedures to monitor and react to heightened risk of bird strikes (Holloman AFB 2006). When bird/wildlife-aircraft hazard strike risks increase, limits are placed on low-altitude flight and some types of training (e.g., multiple approaches, closed-pattern pattern work) in the airport and airspace environments. Special briefings are provided to pilots whenever the potential exists for greater bird strike sightings within the

airspace. F-35A pilots would be subject to these procedures. Therefore, no significant impact would occur related to bird/wildlife-aircraft hazard strike issues.

Auxiliary Airfields

Biggs AAF, EPIA, and RIAC are proposed as the auxiliary airfields for Holloman AFB F-35A aircraft. All of these locations have equipment to handle any potential safety issues associated with the operations of the F-35A aircraft; therefore, no impacts on the flight safety or ground safety resource areas are anticipated for utilization of these outlying fields.

HO 3.5 Soils and Water

HO 3.5.1 Base

HO 3.5.1.1 Base Affected Environment

Soils

Holloman AFB lies within the Tularosa Basin of southern New Mexico, an area characterized by relatively flat topography and surrounding mountain ranges. Earthmoving activities associated with development of Holloman AFB have altered much of the soil profiles to the extent that soil horizons do not completely concur with local soil surveys from adjacent off-base areas.

Holloman AFB is predominantly underlain by Holloman–Gypsum Land–Yesum Complex soils, which are well-drained soils found on nearly level to gently sloping uplands. These soils are typically formed in sediment of eolian (wind-borne) and alluvial (water-borne) origin. The surface layer is typically very fine sandy loam with weak, medium coarse, and granular structure, approximately 3 inches thick. The substratum extends to a depth of 60 inches or more and is a fine, friable sandy loam, generally moist, with gypsum found in lower portions (13–60 inches). These soils have relatively low permeability, shrink-swell potential, and available water capacity and are moderately to highly vulnerable to wind and water erosion. Low vegetative cover in these soils can result in blowing dust. These soils do not provide good roadfill material and have limitations for building construction due to low soil strength and shallow depth to bedrock. In addition, due to periodic flooding and poor drainage, soils at Holloman AFB are locally high in salt and gypsum concentrations (NRCS 1981).

Very small areas in the southwestern and eastern portions of Holloman AFB are underlain by Mead silty clay loam, on 0 to 1 percent slopes. These soils consist of deep, poorly drained soils, found predominantly on alluvial floodplains and formed in fine-textured alluvial deposits with some addition of eolian material. The surface layer is silty clay loam approximately 5 inches thick, with prominent gypsum crystals. The soils contain a high salt content, due to frequent flooding, and become extremely sticky when wet. The substratum extends to a depth of 60 inches or more, with prominent gypsum crystals to a depth of 48 inches. These soils typically have low permeability and available water capacity and moderately high shrink-swell potential. These soils do not provide good roadfill material and have limitations for building construction due to low soil strength, potential for flooding, and higher shrink-swell potential (NRCS 1981).

Water

Surface Water. Holloman AFB is located within the Tularosa Basin, which is a closed basin bound on the east and west by the Sacramento and San Andres Mountains, respectively, and is fed by ephemeral drainages. There are at least nine prominent east–west drainages on Holloman AFB that receive intermittent flows during seasonal thunderstorms (Holloman AFB 2008a). These drainages are broad and deeply entrenched, where extensive downcutting has occurred by as much as 50 feet below the basin floor. The largest of these drainages is the Lost River drainage system, which includes Malone and Ritas Draws. Prior to extensive management of the surface topography and construction of U.S. Routes 70/54, which altered the natural flow regimes, Dillard Draw emptied into the main base, creating a network of alkali flats and ephemeral playas, including what are now Lake Holloman, Stinky Playa, and Lagoon G. Wetlands have been constructed in this area to enhance wildlife habitat.

A total of 868 acres of jurisdictional waters of the United States, including about 120 acres of wetlands and 750 acres of non-wetland waters, have been identified within Holloman AFB (Holloman AFB 2008a). While there are no perennial streams on Holloman AFB, there are waters of the United States that receive storm water discharges from the base, including Lake Holloman, Dillard Draw, Ritas Draw, and the Lost River, as well as three unnamed wetlands (Holloman AFB 2006). Ritas Draw flows into the Lost River, which dissipates into the sand dunes of WHSA. Flows that reach Dillard Draw and Lake Holloman either infiltrate the soil or evaporate. Storm water, typically generated in the arid climate of New Mexico during the months of June through October, is conveyed through drainage channels, underground piping (storm sewer), and, in a few areas, by sheet flow.

Holloman AFB relies on surface water and groundwater for potable water. Surface water from Bonito Lake and natural springs, located in Fresnal and La Luz Canyons, is transported through pipelines to reservoirs at the City of Alamogordo La Luz Water Treatment Plant, which transports treated water to the Boles Field Pumping Station and then to Holloman AFB via pipeline. Three tanks are designated for potable water storage on Holloman AFB.

None of the arroyos on Holloman AFB has been assessed for water quality standards by the State of New Mexico (NMED 2008). However, two arroyos within the Tularosa Basin, Dog Canyon and Three Rivers, are listed on the New Mexico Clean Water Act 303(d) list of impaired waters. Dog Canyon and Three Rivers arroyos are relatively distant (16 and 11 miles, respectively) from Holloman AFB (NMED 2008).

Floodplains. Elevated water levels within ephemeral stream channels near Holloman AFB generally occur between June and October. They are characterized by high peak flows with small volumes that are short-lived. Most of the water that flows through these stream channels evaporates, while a small percentage contributes to groundwater recharge (Holloman AFB 2008a). According to Federal Emergency Management Agency floodplain maps, Dillard Draw, located near the southeastern portion of the base, is associated with a 100-year floodplain.

Groundwater. Holloman AFB is underlain by the Bolson Aquifer, which increases in salinity with its distance from the mountainous areas toward the basin interior, varies in salinity with depth below the surface, and is classified as nonpotable. Groundwater underlying

Holloman AFB contains naturally high total dissolved solids, with salts ranging from 10,000 to 45,000 parts per million, which far exceeds the generally accepted threshold of 800 parts per million.

The only source of potable water is located in perched aquifers below the mouths of mountain canyons, as well as near mountain margins of the major aquifer (Holloman AFB 2006). Holloman AFB withdraws groundwater from a total of 15 wells, with an average depth of 450 to 550 feet, located in the Boles, Escondido, San Andreas, Frenchy, and Douglas well fields. Some of these wells have been installed at depths up to 1,000 feet. Groundwater extracted from the well fields is transported via pipeline to two ground-level storage tank, with a combined capacity of 0.9 million gallons (Holloman AFB 2006).

HO 3.5.1.2 Base Environmental Consequences

Soils and Surface Water. Depending on which F-35A aircraft scenario is selected, construction would disturb up to approximately 88.8 acres of land. Most of the projected construction area has been previously disturbed; however, removal of existing pavement, grading, and excavations would expose the moderately to highly erosive soil to potential wind and water erosion, which, in turn, could result in sedimentation of nearby drainages and creeks.

Because more than 1 acre would be disturbed by construction, a National Pollutant Discharge Elimination System (NPDES) storm water permit would be required. Under the permit, Holloman AFB must develop a construction Storm Water Pollution Prevention Plan (SWPPP) that describes BMPs to be implemented to eliminate or reduce sediment and non-storm-water discharges. The SWPPP would also be completed in compliance with the Holloman AFB Master Sediment Control Plan, which provides information relative to temporary and permanent sediment controls for construction activities throughout the main base to inhibit discharge of contaminated and non-contaminated sediments. This plan segments the main base into zones based on soils, vegetation, and topography, as well as a buffer zone along the banks of arroyos, and provides a methodology for calculating predicted soil loss from specific construction sites based on soil type and slope length.

Surface erosion is best controlled by stabilization practices, such as seeding, mulching, surface roughing, and buffer strips, as well as minimizing the disturbed area and the duration of exposure to disturbance. In addition, erosion can be controlled by structural actions such as construction of silt fences and straw bales, check dams, sediment traps, compost filter berms, and stabilized entrance and exit points to construction sites. With proper design and implementation of the SWPPP, impacts from erosion and offsite sedimentation would be negligible.

The main limitation of soils at Holloman AFB, with respect to construction, would be localized areas of expansive soils, relatively low soil strength, shallow depth to bedrock, periodic flooding, and poor drainage. However, these soil limitations can be mitigated through standard engineering and modern construction techniques, such that significant impacts would not occur.

Floodplains. Elevated water levels within ephemeral stream channels near Holloman AFB generally occur between June and October. They are characterized by high peak flows with

small volumes that are short-lived. Most of the water that flows through these stream channels evaporates, while a small percentage contributes to groundwater recharge (Holloman AFB 2008a). Dillard Draw is located near the southeastern portion of the base and is associated with a 100-year floodplain. The F-35A aircraft scenarios would not include construction or operation within the existing designated 100-year floodplain. In addition, construction would not affect the designated 100-year floodplain; therefore, no flood-related impacts would occur.

Groundwater. The implementation of any of the F-35A aircraft scenarios would not include groundwater withdrawals; therefore, groundwater impacts would not occur.

HO 3.5.2 Airspace

HO 3.5.2.1 Airspace Affected Environment

The land beneath the training airspace is characterized by localized steep rocky slopes that are susceptible to rockfalls, which occur most frequently during early spring, when there is abundant moisture and repeated freezing and thawing. The rocks may freefall, slide, or tumble down slopes in an erratic manner. When a large number of rocks plummet downward at high velocity, it is called a rock avalanche. Rockfalls are caused by the loss of support from underneath or detachment from a larger rock mass. Ice wedging, root growth, or ground shaking, as well as a loss of support through erosion or chemical weathering, may start the fall. However, man's activities can also cause rocks to fall sooner than would occur naturally. Excavations into hills and mountainsides for highways and buildings frequently aggravate rockfalls. Other causes include vibration from passing trains, blasting, changes in groundwater conditions, and sonic booms (Colorado Geological Survey 2010).

HO 3.5.2.2 Airspace Environmental Consequences

Water Quality. F-35A pilots would not train with chaff. However, flares would be used as part of the Proposed Action, as described in Chapter 2, Section 2.4.5, Ordnance and Defensive Countermeasures. Each defensive flare consists of small pellets of highly flammable material that burn rapidly at extremely high temperatures. Flares provide a heat source, other than the aircraft's engine exhaust, to decoy heat-sensitive or heat-seeking targeting systems. The flare ignites upon ejection from the aircraft and burns completely within approximately 3.5 to 5 seconds, or approximately 400 to 500 feet from its release point (Air Force 1997a).

Toxicology studies on flare residual materials indicate that no chemical effects are expected for water resources, since the primary material in flares, magnesium, is not highly toxic. Pieces of plastic, Mylar, and/or paper fall to the earth with each bundle of flare deployed. Such materials are inert and are not likely to adversely impact water quality. The probability of a dud flare hitting the ground is extremely low, at an estimated rate of 0.01 percent of flares deployed. In the unlikely event that an intact dud flare lands in a water body, such as a wetland, creek, pond, or lake, there would be minimal to no effects of the metallic magnesium from the flare on the water body. Magnesium is already a substantial natural component of the earth, and the amount from a flare would be comparably insignificant (Air Force 1997a). Due to the low concentrations of the flare residue and the low probability of flare residue coming in contact with water bodies, flare releases are not expected to cause significant water quality impacts.

Soils. Lichens and cyanobacteria are important components of soil crust communities in the intermountain western United States, especially in areas protected from domestic grazing, wildfire, and off-road vehicle activity. Their presence is critical for soil stability, as well as for the contribution of nitrogen to the ecosystem in a form available to higher plants. Soil crusts in general, and lichens and cyanobacteria in particular, tend to be very sensitive to human-related perturbation, including air pollution (St. Clair et al. 1993; Belnap et al. 2001). The Proposed Action would have a large carbon footprint, and the increased pollution could affect soil crusts, which play a key role in retaining soil moisture and reducing water loss. Such soil crust impacts would be unavoidable.

Rockfalls. Although not common, sonic booms can potentially cause rockfalls to occur in localized areas of steep rocky slopes. Rockfalls are potentially dangerous in areas where people and/or property reside immediately downslope. Such failures would occur along slopes that are already susceptible to failure by other natural and/or manmade factors, as previously described. Typically, slopes prone to rockfalls in developed areas, such as along highway road cuts, have been engineered with protective devices, including wire netting and impact walls. As a result, slope failure reactivation by sonic booms would not be outside the norm for any given slope, such that significant impacts would not occur.

No other ground disturbance would occur in association with airspace operations; therefore, no additional impacts would occur with respect to soil and water.

HO 3.6 Vegetation and Wildlife

HO 3.6.1 Base

HO 3.6.1.1 Base Affected Environment

Vegetation

Holloman AFB is located in the Chihuahuan Desert Province as described by Bailey (1995). Within the cantonment areas on Holloman AFB, much of the original vegetation has been disturbed or removed for air traffic facilities and other base-related uses such as residential development. Where vegetation has been replaced, ornamental plants (both native and introduced) and shade trees, such as desert willow (*Chilopsis linearis*), ocotillo (*Fouquieria splendens*), yuccas (*Yucca* spp.), pines (*Pinus* spp.), and mulberry (*Morus* sp.), have been established. The installation includes a golf course with introduced grasses and lawns that flank some of the residential buildings. Native vegetation in the cantonment area is composed principally of shrublands dominated by four-wing saltbush (*Atriplex canescens*), sometimes accompanied by alkali sacaton (*Sporobolus airoides*), a large perennial grass, and grasslands dominated by alkali sacaton.

The Integrated Natural Resources Management Plan (INRMP) describes the undeveloped portions of Holloman AFB as 45 percent upland, 33 percent duneland, 6 percent arroyo-riparian, 4 percent playa, less than 1 percent constructed/enhanced wetland, and 11 percent miscellaneous, which includes developed areas (Holloman AFB 2008a). Uplands are often dominated by native vegetation, including creosotebush (*Larrea tridentata*), interspersed with lowlands and swales supporting sacaton (*Sporobolus* spp.) and saltgrass (*Distichlis spicata*).

Dunelands support two primary community types: the hoary rosemarymint/sandhill muhly (*P. incana/Muhlenbergia pungens*) community type and the hoary rosemarymint/mesa dropseed (*Poliomintha incana/Sporobolus flexuosus*) community type (Holloman AFB 2008a). Nine drainages cross Holloman AFB from east to west. These are dominated by semi-riparian honey mesquite shrublands, semi-riparian alkali sacaton grasslands, saltcedar woodlands, and pickleweed shrublands. The latter occurs especially in the more playa-like portions along some of the arroyos where the topography flattens out.

Cryptogamic crusts, also known as biological soil crusts, are present in less-disturbed areas. Biological soil crusts are composed of a variety of organisms, including lichens, liverworts, mosses, algae, and blue green algae, and function beneficially by holding the soil in place, increasing infiltration of rainfall, and contributing to soil nutrient status.

Of the 32 plant species currently included on the New Mexico State Noxious Weed List, 7 have been documented on Holloman AFB and 7 are known to exist on adjacent lands and have the potential to spread onto the installation (Holloman AFB 2008a). Other invasive plant species that are not currently classified as noxious, but are being monitored and reviewed by the state and county governments, also occur on Holloman AFB and adjacent lands. In 2006, several species listed by Otero County as invasive species were found on Holloman AFB, including African rue (*Peganum harmala*), Malta star-thistle (*Centaurea melitensis*), Russian knapweed (*Rhaponticum repens*), Russian olive (*Elaeagnus angustifolia*), saltcedar (*Tamarix* spp.), Russian thistle (*Salsola iberica*), and Siberian elm (*Ulmus pumila*) (Holloman AFB 2008a). African rue is particularly invasive, and local management efforts are aimed at preventing its spread. The vegetation on disturbed soils within Holloman AFB may consist largely of introduced plants, such as silverleaf nightshade (*Solanum elaeagnifolium*), Russian thistle, or African rue.

Wildlife

Throughout the Holloman AFB region, suitable wildlife habitat has often been reduced and fragmented as a result of urban, agricultural, and other rural development; roads; and fences (Holloman AFB 2008a). In the base vicinity, pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) are the most widely distributed large, native game animals (Bailey 1995). African oryx or gemsbok (*Oryx gazella*), a large antelope originally introduced as a game animal to southern New Mexico, has become abundant on Holloman AFB. Population reduction hunts periodically occur on Holloman AFB and on the adjacent WSMR, as needed. Within WSMR, oryx hunting has contributed to the reduction of the oryx population from an estimated 5,000 animals in 2000 to an estimated 3,000 to 3,500 animals immediately prior to the 2006 hunt (WSMR 2009a).

Grasslands of the Tularosa Basin and its drainages have been primarily altered from their native state by agricultural practices. This has decreased the habitats available for small mammal communities, most notably for black-tailed prairie dogs (*Cynomys ludovicianus*), which are no longer observed on Holloman AFB (Holloman AFB 2008a). The main base continues to support numerous small colonies of bats that forage for insects in the playas, wetlands, and riparian habitats (Holloman AFB 2008a). Bats are known to use buildings on Holloman AFB as roosting sites (Holloman AFB 2008a). The bats are seasonal inhabitants that migrate south during the winter months. Although individual bats return to Holloman AFB every year, the same roosting site may not be chosen every year. Small mammal surveys conducted on Holloman

AFB recorded 14 species of rodents present. Species common to the area include adaptable predators, such as the badger (*Taxidea taxus*) and coyote (*Canis latrans*), as well as the desert cottontail (*Sylvilagus audubonii*) and black-tailed jackrabbit (*Lepus californicus*).

Characteristic reptiles at Holloman AFB include checkered whiptails (*Cnemidophorus tesselatus),* bullsnakes (*Pituophis melanoleucus*), prairie (or western) rattlesnakes (*Crotalus viridis*), and western diamondback rattlesnakes (*C. atrox*). Fish species that occur in golf course ponds include introduced carp (Cyprinidae) and mosquitofish (*Gambusia affinis*).

At least 230 bird species have been confirmed to have visited Holloman AFB, with a substantial proportion of waterfowl and songbird species using the wetlands associated with Holloman Lake (Holloman AFB 2008a). Typical birds occurring on Holloman AFB include great-tailed grackles (*Quiscalus mexicanus*), which occur near buildings and trees, and Gambel's quails (*Callipepla gambelii),* which frequent the golf course. Some common terrestrial birds include western kingbirds (*Tyrannus verticalis*), Cassin's kingbirds (*T. vociferans*), and Say's phoebes (*Sayornis saya*). In addition, Swainson's hawks (*Buteo swainsoni*), red-tailed hawks (*B. jamaicensis*), northern harriers (*Circus cyaneus*), and Chihuahuan ravens (*Corvus cryptoleucus*) nest locally.

Holloman AFB is located within a minor migration corridor of the Central Migratory Bird Flyway. Ducks and other waterfowl may be observed in a small pond adjacent to the golf course and nesting along a ditch with emergent wetland vegetation, including bulrushes (*Scirpus* spp.) and cattails (*Typha* spp.). The most common species are mallard (*Anas platyrhynchos*), northern pintail (*A. acuta*), teal (*A.* spp.), northern shoveler (*A. clypeata*), and Wilson's phalarope (*Phalaropus tricolor*). In the proximity of the Lake Holloman Wildlife Refuge Area is a complex of small lakes, constructed wetlands, and playas, which provide some of the only permanent water in the vicinity of the base. These wetlands support low populations of breeding species, but substantial numbers of migratory waterfowl and shorebirds during spring and fall. Aquatic birds are observed during the winter in areas of Holloman AFB with permanent surface water. These include American coots (*Fulica americana*), ruddy ducks (*Oxyura jamaicensis*), and American avocet (*Recurvirostra americana*).

Waterfowl and shorebirds attracted to the water features on base contribute to potential bird–aircraft collision danger. Aircraft flying procedures on Holloman AFB include avoidance of direct overflight of water and bird gathering areas. Although not an important cause of bird mortality, collisions between birds and airplanes do occur at Holloman AFB. The low collision rate is likely due to low populations of resident species and their distribution patterns, as well as Air Force procedures to avoid areas with high risk of bird–aircraft collisions.

HO 3.6.1.2 Base Environmental Consequences

Construction

For the beddown of F-35A aircraft at Holloman AFB, approximately 80 to 90 acres of land would be disturbed for construction of needed facilities under Scenario H1W and Scenario H3W, respectively. Construction would occur within previously disturbed portions of base near other development. For the beddown of F-35A aircraft under Scenarios H1 through H5, between 31 acres and 64 acres of land would be disturbed for construction. Under

Scenarios H1 through H5, construction activities may also include demolition and renovation of existing structures and other infrastructure improvements on the base. For all land disturbance calculations, 10 percent was added outside of the project footprints to account for temporary land disturbance likely to occur for equipment access and laydown areas.

For construction and demolition activities in developed portions of Holloman AFB, no long-term effects on vegetation and wildlife are anticipated. During demolition and construction activities on Holloman AFB, the amount of noise and dust generated is expected to increase during working hours, although normal precautions would be taken to minimize these effects (see Sections HO 3.2, Noise, and HO 3.3, Air Quality). Additionally, measures to control erosion and siltation would be included as part of the project implementation. Revegetation of temporarily disturbed areas would be conducted as directed by the base to minimize the potential for continued erosion and dust generation and to decrease the duration of temporary habitat loss. To comply with the Migratory Bird Treaty Act and the DoD Bat Protection Memorandum of Understanding and to assure no habitation by nesting birds or sensitive bat species, abandoned buildings would be surveyed for these species before their demolition and removal. Because areas proposed for construction on Holloman AFB have already largely been disturbed, no significant adverse effects on vegetation or wildlife are expected.

Operations

No effects on vegetation are expected from F-35A operations in the vicinity of Holloman AFB. Wildlife species on and near Holloman AFB exist in an airfield environment, which includes regular takeoffs, landings, and low-level overflights by military aircraft. The noise levels associated with the F-35A aircraft vary considerably, according to the actual flight profile. Noise levels expected as a result of implementing the F-35A aircraft scenarios would be qualitatively similar to the existing noise environment. Wildlife species in the vicinity of Holloman AFB live in a military airfield environment and would not be expected to be adversely affected by changes in aircraft overflight and noise associated with the beddown of the F-35A aircraft.

HO 3.6.2 Airspace

HO 3.6.2.1 Airspace Affected Environment

Vegetation

Vegetation communities in the general project area are determined by regional climate, especially precipitation, soils, slope and slope aspect, elevation, and the land use of southern New Mexico. Vegetation cover types that occur in the region under the MOA airspaces vary from desert grasslands, to scrublands, to forests and subalpine areas. Table HO 3.6–1 lists the vegetation or land cover types that occur under the project airspace, acreage, and percentage of the land overlain by the airspace covered by each type.

Vegetation underlying proposed training airspace generally follows an elevation gradient that begins with grasslands mixed with shrubs at lower elevations, transitions to shrubland mixed with forest stands at moderate elevations, and becomes denser forest cover at higher elevations.

Table HO 3.6–1. Vegetation/Land Cover Types Under Holloman AFB Primary Use Airspace

Vegetation/Land Cover Classification	*Acres Under the Airspace*	*Percentage of the Total Area Under Airspace*
Semidesert grasslands	5,539,492	28
Plains-mesa grasslands	4,533,599	23
Chihuahuan desertscrub	4,262,381	22
Coniferous and mixed woodlands	3,917,377	20
Interior chaparral	47,647	< 1
Montane coniferous forests	1,201,033	6
Subalpine coniferous forests	82,214	< 1
Closed basin scrub	9,072	< 1
Alpine tundra	1,104	< 1
Open water	7,836	< 1
Total	**19,601,755**	**100**

Source: AZGFD 2004. GIS data digitized from the August 1980. David E. Brown & Charles H. Lowe 1:1,000,000 scale, 'Biotic Communities of the Southwest.'

Grasslands. The lowest-elevation vegetation cover types in the ROI include the semidesert grasslands and plains-mesa grasslands. Grasslands cover approximately 50 percent of the lands under the proposed airspace units. The lower-elevation limit of desert grassland occurs around 3,600 feet MSL, and this vegetation type occurs as an ecotone in the project region, having shrubs intermixed with grasses (Dick-Peddie 1993). Ecologically important grasses are black grama (*Bouteloua eriopoda*) found on gravelly upland sites and tobosa (*Hilaria mutica*), the dominant grass on heavier soils in lowlands and swales. Other grasses include various grama grasses (*Bouteloua* spp.), red three-awn (*Aristida longiseta*), hairy tridens (*Tridens pilosus*), and buffalograss (*Buchloe dactyloides*). Lupines (*Lupinus* spp.), filarees (*Erodium* spp.), and buckwheats (*Eriogonum* spp.) are common forbs. Cacti and succulent plants, such as agaves (*Agave* spp.*)*, sotol (*Dasylirion* spp.), and yucca, are characteristic of semidesert grasslands. Important shrubs include mesquite (*Prosopis* spp.), all-thorn (*Koeberlinia spinosa*), and catclaw acacia (*Acacia greggii*). Grazing and drought have likely affected the encroachment of woody plants on the desert grasslands. Tarbush (*Flourensia cernua*) and creosotebush (*Larrea tridentata*), desertscrub species, have increased in grasslands in response to disturbance. In some areas, the native perennial bunchgrasses have been replaced by exotic annual grasses and low-growing sod grasses, such as Lehmann's lovegrass (*Eragrostis lehmanniana*) and curly mesquite grass (*Hilaria belangeri*), respectively. Semidesert grasslands primarily occur under the Pecos, Beak, and Talon MOAs; McGregor and WSMR airspace; IR-134/195; and IR-192/195 in the ROI.

Plains-mesa grasslands are found between 4,000 and 7,500 feet MSL on plains, mesas, and low hills. Blue grama (*Bouteloua gracilis*) and other grama grasses dominate within mixed and shortgrass prairies. Other important grasses include buffalograss (*Buchloe dactyloides*), Indian ricegrass (*Achnatherum hymenoides*), dropseeds (*Sporobolus* spp.), galleta grass (*Hilaria jamesii*), and lovegrass (*Eragrostis* spp.). Plains-mesa grasslands primarily occur under the Pecos, Beak, and Cato MOAs; northern WSMR airspace, and IR-133/142. Although shrubs have always been part of the plains-mesa grasslands, the shrub component has increased in recent decades due to livestock grazing and fire suppression (Bailey 1995). Four-wing saltbush, winterfat (*Krascheninnikovia* [=*Ceratoides*] *lanata*), rabbitbrush (*Chrysothamnus* spp.), and snakeweed (*Gutierrezia* spp.) are common shrubs. Forbs such as coneflowers (*Ratibida* spp.) and

globemallows (*Sphaeralcea* spp.), and pricklypear cacti (*Opuntia* spp.) are also important in plains-mesa grasslands.

Airspace units that overlie the plains-mesa grasslands include the Pecos, Talon, Beak, and Cato MOAs; McGregor and WSMR airspace; IR-192/195; IR-134/195; and IR-133/142.

Chihuahuan Desertscrub. Chihuahuan desertscrub covers approximately 4,262,381 acres (22 percent) of the lands under the proposed airspace. Creosotebush is the most widespread and abundant plant in the Chihuahuan desertscrub, especially on gravel fans in lower-elevation shrubland, occurring often with tarbush as a co-dominant species (Dick-Peddie 1993). On deep soils, however, honey mesquite (*Prosopis glandulosa*) becomes the dominant plant, and cacti are abundant, particularly prickly pear. Other plants that are common to abundant in the province include yuccas, lechuguilla (*Agave lechuguilla*), and ocotillo (Bailey 1995). Cottonwoods (*Populus* spp.) occur along waterways where moisture is adequate.

Airspace units that overlie the Chihuahuan desertscrub include McGregor and WSMR airspace, the Talon MOA, IR-134/195, and IR-192/195.

Coniferous and Mixed Woodlands. Coniferous and mixed woodland vegetation communities constitute approximately 20 percent of the lands under the proposed airspace on 3,917,377 acres. This community supports species such as piñon pine (*Pinus edulis*) and one-seed juniper (*Juniperus monosperma*), together commonly called piñon-juniper woodland. This woodland is found between 4,900 and 7,500 feet MSL, particularly on rocky mesas, plateaus, slopes, and ridges (Dick-Peddie 1993). Understory vegetation includes grama grasses, galleta grass, Indian ricegrass, buckwheats, and lupines. Because the canopy is fairly open, woody shrubs, including threadleaf groundsel (*Senecio longilobus*), snakeweed, four-wing saltbush, and cliffrose (*Cowania mexicana*), may grow between the piñons and junipers. Several species of hedgehog cacti (*Echinocereus* spp.), pricklypears, and chollas (*Opuntia* spp.) are also present. Deciduous trees, such as Gambel oak and other oak species, and Texas madrone (*Arbutus xalapensis*) may also be present. Coniferous and mixed woodlands primarily occur under the Beak, Cato, and Talon MOAs; WSMR airspace; and IR-134/195 and IR-192/195 in the ROI.

Airspace units that overlie the coniferous and mixed woodlands include the Beak, Cato, and Talon MOAs; McGregor and WSMR airspace; and all three Instrument Routes.

Interior Chaparral. Interior chaparral (also known as montane scrub) vegetation may intermix into woodland communities following burns and logging disturbances and typically persists until trees return. Chaparral vegetation in this region is dominated by mountain mahogany (*Cercocarpus montanus*), gray oak (*Quercus grisea*), algerita (*Berberis haematocarpa*), sotol (*Dasylirion wheeleri*), and sumacs (*Rhus* spp.).

Airspace units that overlie interior chaparral include WSMR airspace, the Talon MOA, and IR-134/195.

Montane Coniferous Forests. Montane coniferous forests, which occur from approximately 7,000 to 10,000 feet MSL, are composed of Douglas fir (*Pseudotsuga menziesii* var. *glauca*), white fir (*Abies concolor*), blue spruce (*Picea pungens*), ponderosa pine, piñon pine, and various oak species (Dick-Peddie 1993). Montane coniferous forests were mapped on approximately

1,201,033 acres (6 percent) of lands under project airspace. Abundant moisture in the form of rain and snow and good soils support comparatively lush understories with a variety of woody shrubs, flowering forbs, and grasses. When moisture is adequate along riparian drainages, cottonwood, salt cedar (*Tamarix ramosissima*), an invasive nonnative species, and willows (*Salix* spp.) can occur at this elevation and continue into adjacent vegetation communities.

Airspace units that overlie the montane coniferous forests include the Cato and Beak MOAs and IR-134/195. Cowboy and Ancho ATCAAs also overlie a significant portion of montane coniferous forests.

Subalpine Coniferous Forests—Alpine Tundra. Subalpine coniferous forests occur at the upper elevations on approximately 82,214 acres (less than 1 percent) of lands in the proposed airspace from 9,500 feet MSL to timberline, approximately 12,000 feet. In the harsh environment, the growing season is short with heavy snow cover, shallow soils, and extreme temperatures. Dominant tree species include Engelmann spruce (*Picea engelmannii*) and corkbark fir (*Abies lasiocarpa* var. *arizonica*) (Dick-Peddie 1993).

Alpine tundra occurs above the subalpine coniferous forests and covers a very small portion of lands under the proposed project ROI (less than 1 percent). This high-elevation (above 11,500 feet MSL) habitat primarily supports low-growing cushion-type plants that are tolerant of intense sunlight, high winds, and cold temperatures. Common cushion plants include alpine avens (*Geum rossii*), bistort (*Polygonum bistortoides*), and alpine sage (*Artemisia scopulorum*) (Dick-Peddie 1993).

Very small portions of the Cato and Beak MOAs overlie the subalpine coniferous forests—alpine tundra land cover types. Larger areas occur under the Cowboy and Ancho ATCAAs.

Closed Basin Scrub. Closed basin scrub areas occur in broad, flat, undrained, or poorly drained basins, where water tends to spread rather than run off (Dick-Peddie 1993). These areas can be large (although difficult to map at the scale of this project's airspace) and typically have elevated salinity and alkalinity and consequently support species tolerant of these conditions, such as four-wing saltbush and burrograss (*Scleropogon brevifolius*).

Open water and wetland habitats are discussed in Section HO 3.7, Wetlands and Aquatic Communities.

Wildlife

In general, wildlife species are associated with specific habitats defined by the vegetation composition. Some species are dependent on specific habitats, while other species are generalists and may occur in more than one habitat type. This section discusses the wildlife species associated with the primary vegetation types listed in Table HO 3.6–1 as occurring under the airspace MOAs.

Wildlife species described for Holloman AFB in Section HO 3.6.1 would also be common in other Chihuahuan desertscrub and closed basin riparian scrub vegetation types under the airspace. These include the black-throated sparrow (*Amphispiza bilineata*), greater roadrunner (*Geococcyx californianus*), curve-billed thrasher (*Toxostoma curvirostre*), Chihuahuan raven, scaled

quail (*Callipepla squamata*), and Gambel's quail. Characteristic raptors that occur in the desert and basin areas include the golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), red-tailed hawk, and ferruginous hawk (*B. regalis*). The Chihuahuan desertscrub supports a large number of reptile species, including the collared lizard (*Crotaphytus collaris*), Texas horned lizard, desert spiny lizard (*Sceloporus magister*), and various rattlesnakes (*Crotalus* spp.) (Bailey 1995).

Typical mammals associated with plains-mesa grasslands are the pronghorn, black-tailed prairie dog (*Cynomys ludovicianus*), swift fox (*Vulpes velox*), and plains pocket gopher (*Geomys bursarius*) (Brown 1994). Representative birds that occupy this habitat include the lesser prairie-chicken (*Tympanuchus pallidicinctus*), long-billed curlew (*Numenius americanus*), western burrowing owl (*Athene cunicularia hypugea*), lark bunting (*Calamospiza melanocorys*), and western meadowlark (*Sturnella neglecta*). Additional specialist species typically found in mixed grasslands include reptiles such as the six-lined racerunner (*Cnemidophorus sexlineatus*), many-lined skink (*Eumeces multivirgatus*), Great Plains skink (*Eumeces obsoletus*), and plains blackheaded snake (*Tantilla nigriceps*), and mammals such as the thirteen-lined ground squirrel (*Spermophilis tridecemlineatus*) and hispid pocket mouse (*Chaetodipus hispidus*) (Parmenter et al. 1994). Agricultural development has affected much of the plains-mesa grasslands. Domestic livestock that occur on pasturelands under the airspace (urban and farmland cover type) include cattle, sheep, and horses. Many of the birds and small mammals listed occupy edges of agricultural areas.

Mammals common to the desert grassland vegetation type are the black-tailed jackrabbit, spotted ground squirrel (*Spermophilis spilosoma*), various species of kangaroo rats (*Dipodomys* spp.), and woodrats (*Neotoma* spp.). Birds associated with desert grasslands include Swainson's hawk, mourning dove (*Zenaida macroura*), greater roadrunner, ash-throated flycatcher (*Myiarchus cinerascens*), curve-billed thrasher, and Cassin's sparrow (*Aimophila cassinii*). Ornate box turtle (*Terrapene ornata*), western hognose snake (*Heterodon nasicus*), western hooknose snake (*Gyalopion canum*), and desert grassland whiptail (*Cnemidophorus uniparens*) are representative reptiles of the area.

The plains-mesa sand scrub is perhaps best known for its diversity and abundance of reptiles. Lizards include the Texas banded gecko (*Coleonyx brevis*), greater earless lizard (*Cophosaurus texanus*), and several species of spiny lizards (*Sceloporus* spp.) and whiptails (*Cnemidophorus* spp.). Snakes include the western hooknose snake, whipsnakes (*Masticophis* spp.), and rattlesnakes. Typical mammals found in plains-mesa sand scrub are the desert pocket gopher (*Geomys arenarius*), southern grasshopper mouse (*Onychomys torridus*), Texas antelope squirrel (*Ammospermophilis interpres*), and desert pocket mouse (*Perognathus penicillatus*). Scaled quail, Chihuahuan raven, cactus wren (*Campylorhynchus brunneicapillus*), and black-throated sparrow are representative birds.

Woodland species in the juniper savanna and coniferous and mixed woodlands include the piñon mouse (*Peromyscus truei*), scrub jay (*Aphelocoma coerulescens*), piñon jay (*Gymnorhinus cyanocephalus*), gray flycatcher (*Empidonax wrightii*), and gray vireo (*Vireo vicinator*). Piñon-juniper stands, as part of mixed woodlands, are also important habitat for wintering elk and mule deer (Brown 1994).

Typical wildlife species of the montane vegetation types (including montane grasslands, montane scrub, and montane coniferous forest) overlapping into the subalpine coniferous forest in the ROI includes ungulates such as elk (*Cervus elaphus*) and mule deer, black bear (*Ursus americanus*), mountain lion (*Felis concolor*), and raptors ranging from accipiters in the forests (e.g., goshawk [*Accipiter gentilis*] and Cooper's hawk [*Accipiter cooperii*]) to buteos and eagles in foothills and grasslands (red-tailed hawk and golden eagle). Perching bird species include gray jay (*Perisoreus canadensis*), Stellar's jay (*Cyanocitta stelleri*), mountain chickadee (*Parus gambeli*), mountain bluebird (*Sialia currucoides*), spotted towhee (*Pipilo erythrophthalmus*), and rock wren (*Salpinctes obsoletus*). There are also a few reptiles, primarily rattlesnakes (*Crotalus* spp.), in the foothills and scrub.

Auxiliary Airfields

Biggs AAF. Biggs AAF is located in Fort Bliss, Texas, approximately 103 miles south of Holloman AFB, and is adjacent to EPIA. Even though Fort Bliss supports a relatively high diversity of habitats and wildlife, the area around Biggs AAF was mapped as having land cover primarily consisting of "Barren, Facilities, Non-native, Urban, No Data" (Army 2001). As a currently active Army airfield adjacent to EPIA and other human development, species expected in this area would be accustomed to frequent air and ground vehicular traffic activity and local disturbance.

EPIA. Located adjacent to and essentially surrounded by Fort Bliss and Biggs AAF, EPIA is a currently active commercial and general aviation airport supporting the region's air traffic. Because the airport is primarily fully developed, land cover would be essentially the same as described for Biggs AAF, including barren areas or areas supporting only nonnative species. Any wildlife species that could tolerate the high level of human activity in the area would include common urban species of the southwest that likely roost and nest in residential neighborhoods to the south.

RIAC. RIAC is situated 3 miles south of Roswell, New Mexico, and approximately 133 miles east of Holloman AFB. Vegetation and wildlife species expected in the area would be somewhat similar to those described for Holloman AFB, especially species tolerant of human presence and disturbance. RIAC is currently operating as a civilian airport and as a storage location for a large number of mothballed airliners. The airfield environment is mostly built up and contains little or no undisturbed habitat.

HO 3.6.2.2 Airspace Environmental Consequences

Operations impacts on biological resources from the F-35A aircraft scenarios could result from low-level overflights and associated noise, sonic booms, munitions use and the use of flares, and bird–aircraft collisions. A comprehensive review of current literature evaluating potential effects on wildlife and habitat from overflight, noise, and sonic booms is presented in Appendix B.

Low-Level Overflight and Noise. All airspace units that would be used for F-35A training are currently used as active military airspace by military jet aircraft, including F-16s, A-10s, and, until recently, F-22s; therefore, wildlife in these areas have previous exposure to military jet overflight, including low-level overflight and noise, sonic booms, and use of munitions and

defensive countermeasures that would be associated with introducing the F-35A aircraft and will be analyzed in this section. The sudden visual appearance of the aircraft and onset of noise from a low-level overflight has the potential to startle wildlife. Both the visual appearance and noise levels of aircraft diminish rapidly with increasing altitude.

Under the F-35A beddown scenarios, the change in total annual sortie-operations flown in the primary use training airspace units relative to baseline conditions would range from an increase of 10.8 percent to 102.3 percent. Animals living beneath those airspace units in which an increase in operations would occur may experience an incremental increase in the number of loud overflight noise events per day. However, the F-35A would spend 93 percent of airspace training time at altitudes above 5,000 feet AGL (see Table HO 2.2–5).

At the altitudes where the F-35A would spend most of its time, overflight noise (as perceived from the ground) would increase relatively gradually from ambient to the peak noise level. Overflight events at these altitudes would not be expected to be startling to animals or to have other adverse impacts. Based on (1) the very low percentage of time spent in low-level flight by F-35As training within the airspace and (2) the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, no significant adverse effects on vegetation or wildlife from overflights or noise are anticipated to be associated with the addition of F-35A training.

Sonic Booms. The sound of a sonic boom can be like thunder: either a sharp double clap if the aircraft is directly overhead or a distant rumble if the aircraft is at a distance. The intensity of the boom (overpressure) at the Earth's surface decreases with an increase in the altitude at which the aircraft goes supersonic. Overall, studies of wildlife and domestic animals have demonstrated that behavioral responses are of short duration and rarely result in injury or negative population effects (Krausman et al. 1998; Weisenberger et al. 1996). Habituation to more-frequent sonic booms may also occur (e.g., Ellis et al. 1991; Workman et al. 1992). Habituation to thunderclaps and rumble associated with seasonally frequent thunderstorms within the ROI is also expected to minimize the response of birds, mammals, and domestic animals to sonic booms.

Sonic booms produced by the F-35A aircraft are expected to be less intense than sonic booms generated by the F-22, based at Holloman AFB until recently, and slightly more intense than those generated by the F-16. At a given altitude, overpressures associated with an F-35A sonic boom in straight and level flight at Mach 1.2 are approximately 80 to 90 percent as large as those produced by the F-22 and 10 to 20 percent more intense than those produced by the F-16 (from data in Table HO 3.2–6). Under Scenarios H1W, H2W, and H3W, the addition of proposed F-35A sortie-operations would increase the average number of sonic booms experienced near the center of the training airspace units, which average 1.8 per day or fewer under baseline conditions, by up to 0.3 booms per day. Under Scenarios H1, H2, H3, H4, and H5, the average number of sonic booms per day would decrease or remain the same as under baseline conditions except over the McGregor Range, where it would increase by 0.1 booms per day. The projected incremental increase in sonic booms associated with F-35A training is not expected to result in a significant impact on wildlife since sonic booms and seasonally frequent thunderclaps currently exist in the training airspace, the majority of training flights take place at altitudes above 10,000 feet AGL, and free-ranging wildlife generally have minimal responses to sonic booms.

Munitions Use and Defensive Countermeasures. All ranges proposed for the use of live and inert munitions by F-35A training currently support munitions use, with the exception of Yonder airspace unit at WSMR, which currently allows no air-to-ground munitions use. Munitions use is restricted to specific designated target areas on ranges within WSMR, which are maintained in a mowed or bladed (bare ground) condition (WSMR 2002) to minimize fire hazard. Target areas would not likely attract wildlife species because of limited habitat and resource availability.

In contrast to most other military jet aircraft, the F-35A would not deploy chaff as a defensive countermeasure against radar-guided missiles. It would deploy defensive flares to counter heat-seeking missiles, as do most other military jet aircraft. Residual materials from a deployed flare likely to reach the ground are listed in Chapter 2, Table 2–11, and include a small square piece of plastic or nylon, a small square piece of silicon foam, a plastic spring device, and a strip of graphite material similar to duct tape. Should one of these items be encountered by a wild or domestic animal, the animal is not expected to consume it or otherwise be affected by it. Generally, the duration of a flare burn is a few seconds and the flare burns out within a few hundred feet of its release altitude. If a flare were to reach the ground while still burning, it could ignite dry vegetation and start a wildland fire. Because of this, in fire-prone areas, special restrictions on flare use may be instituted to further minimize the potential for a burning flare to reach the ground. Risks of starting a fire remain extremely small as long as the minimum altitude for flare deployment remains designated above 2,000 feet AGL and restrictions on flare use in extreme fire conditions continue to be established by a Command or base to reduce fire risks further. Flare use would be restricted to any authorized airspace where flare use is currently permitted. Restricting flare use to authorized airspace and altitudes reduces the potential for wildland fire ignition and spread. Periodic wildland fire is a regular occurrence in arid grassland ecosystems, and the vegetation and wildlife species are well-adapted to periodic fire, having mechanisms to escape and survive fire and to regenerate after fire. It is unlikely that flare use associated with the F-35A training would appreciably increase the incidence of wildland fires given measures implemented to reduce the potential for fire from flare use; therefore, impacts on vegetation and wildlife would be less than significant. Additional details on flares are presented in Chapter 2, Section 2.4.5.

Bird–aircraft or other wildlife–aircraft collisions would occur infrequently and would not represent a substantial source of mortality for any species.

Auxiliary Airfields

Biggs AAF. No construction or other modification associated with F-35A training is expected at Biggs AAF. Under baseline conditions, annual airfield operations total 126,301 (see Table HO 2.2–6). Implementation of F-35A training would add between 3,884 and 19,420 airfield operations per year, depending upon the scenario, representing an increase of 3 to 15 percent above baseline levels. Due to Biggs AAF's long history as an airfield and its ongoing level of activity, wildlife species in the vicinity would be habituated to noise and aircraft overflight and are not expected to be adversely affected by changes in aircraft overflight and noise associated with transitioning to the F-35A aircraft.

EPIA. No construction or other modification associated with F-35A training is expected at EPIA. Under baseline conditions, annual airfield operations total 109,190 (see Table HO 2.2–6).

Implementation of F-35A training would add between 2,871 and 14,355 airfield operations per year, depending upon the scenario, representing an increase of 3 to 13 percent above baseline levels. Due to EPIA's long history as an airfield and its ongoing level of activity, wildlife species in the vicinity would be habituated to noise and aircraft overflight and are not expected to be adversely affected by changes in aircraft overflight and noise associated with transitioning to the F-35A aircraft.

RIAC. No construction or other modification associated with F-35A training is expected at RIAC. Existing annual airfield operations by military and civilian aircraft total 60,772 (see Table HO 2.2–6). Implementation of F-35A training would add between 3,208 and 16,040 airfield operations per year, depending upon the scenario, representing an increase of 5 percent to 26 percent above baseline levels. Due to RIAC's long history as an airfield and its ongoing level of activity, wildlife species in the vicinity of RIAC would be habituated to noise and aircraft overflight and are not expected to be adversely affected by changes in aircraft overflight and noise associated with transitioning to the F-35A aircraft.

HO 3.7 Wetlands and Aquatic Communities

HO 3.7.1 Base

HO 3.7.1.1 Base Affected Environment

There are at least nine prominent east–west drainages on Holloman AFB that receive intermittent flows during seasonal thunderstorms (Holloman AFB 2008a). These drainages are broad and deeply entrenched where extensive downcutting has occurred by as much as 50 feet below the basin floor. The largest of these is the Lost River drainage system, including Malone Draw and Ritas Draw. Prior to extensive management of the surface topography and construction of U.S. Routes 70/54, which altered the natural flow regimes, Dillard Draw emptied into the main base, creating a network of alkali flats and ephemeral playas, including what are now Lake Holloman, Stinky Playa, and Lagoon G. Wetlands have been constructed in this area to enhance wildlife habitat.

A total of 868 acres of jurisdictional waters of the United States, including about 120 acres of wetlands and 750 acres of non-wetland waters, have been identified within Holloman AFB (Holloman AFB 2008a). Some of the wetlands consist of ponds and sections of open ditches that support cattail and bulrush (*Scirpus* spp.). Along some ditches, the vegetation is dominated by the introduced invasive saltcedar, while others are lined with a mix of native and invasive vegetation that includes saltbush, silverleaf nightshade, Russian-thistle, globemallow, buffalo gourd (*Cucurbita foetidissima*), desert willow, creosotebush, and common reed (*Phragmites australis*). Although there are no perennial streams on Holloman AFB, there are waters of the United States that receive storm water discharges from the base, including Lake Holloman, Dillard Draw, Ritas Draw, Lost River, and three unnamed wetlands.

HO 3.7.1.2 Base Environmental Consequences

No wetlands or aquatic habitats would be within the construction zones where they could be directly affected by construction. Measures to control erosion, siltation, and fugitive dust would be included as part of the project implementation, minimizing the potential for

construction to indirectly affect offsite aquatic and wetland habitats and biota. No effects on aquatic and wetland habitats are expected from F-35A operations in the vicinity of Holloman AFB.

HO 3.7.2 Airspace

HO 3.7.2.1 Airspace Affected Environment

Wetlands and aquatic habitat represent a very small, but ecologically important, fraction of the habitat under the airspace. Wetlands and aquatic habitat under the WSMR and McGregor portions of the project airspace include springs, seeps in mountainous areas, and wetland marshes and creeks in the Tularosa Basin (WSMR 2002). Other regional wetland features usually occur as ephemeral ponds, commonly known as playas, which form in undrained or poorly drained basins.

Despite their limited geographic area in this arid region, wetlands and riparian areas are of extremely high importance for food, water, cover, breeding, brood-rearing, and shade for most animal species, particularly migratory birds. Typical wetland plants in the region include cattail, bulrush, rushes, and sedges, often interspersed with willows. Most native riparian habitats in this region have been adversely affected by increased water demands and invasion by exotic species, particularly the woody plants saltcedar and Russian olive. Plains cottonwood (*Populus deltoides*), peachleaf willow (*Salix amygdaloides*), and narrowleaf cottonwood (*P. angustifolia*) are the dominant native trees in the riparian community along the larger river systems. Riparian scrublands, composed of several willow species, seepwillow (*Baccharis salicifolia*), and saltcedar, are found along floodplains and streams throughout the region. At the higher elevations of the ROI, riparian communities of streams and canyons are characterized by narrowleaf cottonwood, maple (*Acer* spp.), box elder (*Acer negundo*), alders (*Alnus* spp.), willows, blue elderberry (*Sambucus glauca*), and red-osier dogwood (*Cornus sericea*).

Auxiliary Airfields

Biggs AAF. A study of arroyos and drainages conducted for the Fort Bliss INRMP did not identify probable waters of the United States in the Biggs AAF area (Army 2001). The INRMP stated that individual wetlands boundary delineations would occur on a project-by-project basis as needed on Fort Bliss. Most of the probable waters of the United States on Fort Bliss did not qualify as jurisdictional wetlands under U.S. Army Corps of Engineers criteria.

EPIA. As described for Biggs AAF, no jurisdictional wetlands or waters of the United States have been identified as occurring on EPIA or are expected to occur there. Being a heavily urbanized parcel, it is not likely to encompass any natural wetland or aquatic values.

RIAC. No permanent or intermittent streams, ponds, or lakes occur at RIAC (Air Force 1989). In the region, artesian springs and other important wetlands in the Roswell area are located more than 10 miles east of RIAC in association with the Pecos River, the Bitter Lake National Wildlife Refuge (NWR), and the Bottomless Lakes State Park (USFWS 2008). These wetlands support many unique, endemic species, as well as thousands of migratory birds. Playa lakes occur further east in New Mexico and western Texas.

HO 3.7.2.2 Airspace Environmental Consequences

No adverse effects on aquatic and wetland habitats are expected from F-35A training operations in project airspace. There is a very low probability that an unburned flare or material from a flare would reach an aquatic or wetland environment. Magnesium, the major chemical component of flares, can be toxic at extremely high levels, a situation that could occur only under repeated and concentrated use in localized areas, which would not occur because of the widely dispersed nature of flare deployment. No adverse effects on aquatic and wetland habitats are expected from F-35A training use of the auxiliary airfields (Biggs AAF, EPIA, or RIAC) because no ground disturbance would occur.

HO 3.8 Threatened, Endangered, and Special Status Species

For purposes of this assessment, sensitive biological resources are defined as those plant and animal species listed as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) and species that are listed for conservation-related reasons by the New Mexico Department of Game and Fish (NMDGF).

HO 3.8.1 Base

HO 3.8.1.1 Base Affected Environment

No federally listed threatened or endangered plant or animal species is known to occur on Holloman AFB (Holloman AFB 2008a). Threatened and endangered species surveys have been conducted every 3 to 5 years on Holloman AFB and are planned to continue on this schedule. The 2008 INRMP provides management planning and conservation benefits to species present to avoid decline in populations that may lead toward listing under the ESA.

During project scoping, the NMDGF expressed concern for the White Sands pupfish (*Cyprinodon tularosa*), state-listed as threatened, and a USFWS species of special concern. This small fish is endemic to only the Tularosa Basin of New Mexico, within which Holloman AFB occurs. The species occurs naturally in two areas on WSMR and was introduced into another spring within WSMR and into the Lost River on Holloman AFB in 1970. The White Sands pupfish is considered the most sensitive species identified within Holloman AFB (Holloman AFB 2008a). Habitat for the species is protected under a Cooperative Agreement for Protection and Maintenance of White Sands Pupfish between the U.S. Army (WSMR), U.S. Air Force (Holloman AFB), National Park Service (WHSA), USFWS, and NMDGF, which was signed in 1994, revised in 1998, and renewed in 2006 (Army 2006). Per the agreement, conservation actions for the pupfish were developed and essential habitat, limited use areas, and areas of concern were designated on Holloman AFB.

The White Sands pupfish inhabits clear, shallow, strongly alkaline pools and streams with fine mud-silt and sand bottoms (Holloman AFB 2008a). Within its limited habitat, populations are often dense, but numbers can exhibit wide fluctuations due to natural environmental perturbations such as flood or drought (WSMR 2009a). The White Sands pupfish is omnivorous, feeding mainly on aquatic insects and larvae, algae, and organic detritus. Nonnative fish species can pose a threat to White Sands pupfish populations, and occupied spring ponds with low salinity are susceptible to invasion by predatory nonnative fishes

(WSMR 2009a). Water levels and salinity of the ponds and lakes often fluctuate seasonally, creating an environment inhospitable to nonnative fishes, but one in which White Sands pupfish can survive (WSMR 2009a).

The White Sands pupfish population living in the Lost River on Holloman AFB is distributed in three stream segments connected by water only at times of heavy rains or heavy runoff from canyons on the western slope of the Sacramento Mountain escarpment (Holloman AFB 2008a). A narrow ribbon of riparian vegetation in the westernmost reaches of the Lost River provides suitable habitat for one surviving population of the White Sands pupfish. Three other populations originally observed in 1987 within this reach were found to be extirpated during surveys conducted in 1995 (Holloman AFB 2008a). This decline may be linked to encroachment by the surrounding dunefield. However, USFWS and the Air Force determined that, under Air Force policy (AFI 32-7064) (Air Force 2004), the Holloman AFB 2002 INRMP provided adequate special management or protection for the White Sands pupfish to avoid the need to list the species under the ESA.

New Mexico ranks species of concern in the state (that are not federally listed) as species of greatest conservation need. In addition to the White Sands pupfish, species of greatest conservation need that occur on base lands (including the Boles Wells Water System Annex [BWWSA]) include loggerhead shrike (*Lanius ludovicianus*), western burrowing owl, Mexican free-tailed bat (*Tadarida brasiliensis*), pallid bat (*Antrozous pallidus pallidus*), Wilson's phalarope, white-faced ibis (*Plegadus chihi*), and snowy plover (*Charadrius alexandrius*) (Holloman AFB 2008a). As mentioned in the discussion of on-base wildlife in Section HO 3.6.1, bats are known to use buildings as roosting sites (Holloman AFB 2008a). In addition, the western burrowing owl, also a USFWS species of concern, occurs on dry, open, shortgrass prairie to barren grounds around the southern portions of Holloman AFB and near runways (Holloman AFB 2008a). The species has been known to be tolerant of high levels of human activity, but it can also be present in more-remote areas where suitable habitat exists (Holloman AFB 2008a). The Texas horned lizard (*Phrynosoma cornutum*), a USFWS species of concern, is apparently abundant on Holloman AFB (Holloman AFB 2008a).

HO 3.8.1.2 Base Environmental Consequences

No known federally listed threatened or endangered wildlife species or their habitats occur on Holloman AFB; therefore, no adverse effects on federally listed wildlife are anticipated from implementation of the F-35A aircraft scenarios at Holloman AFB. Because the proposed construction areas on Holloman AFB are located in previously disturbed areas, no significant impacts on other sensitive species observed on base or that may occur on base would result from proposed construction of project facilities. Should burrowing owls or other state species of concern be detected at Holloman AFB where construction would occur, appropriate consultation with the NMDGF would be undertaken and measures to avoid potential adverse impacts on the species would be conducted.

No significant impacts from airfield operations would be expected on special status wildlife that may occur on base due to the qualitatively similar nature of F-35A operations to current and historical operations associated with the existing military airfield environment at Holloman AFB.

HO 3.8.2 Airspace

HO 3.8.2.1 Airspace Affected Environment

As part of the environmental impact analysis process for this project, USFWS and the NMDGF were contacted for information on species of concern in the project ROI, which includes airspace. The federally listed species that are known to occur under airspace proposed for use by this project are presented in Table HO 3.8–1.

Table HO 3.8–1. Federally Listed, Proposed, and Candidate Species That May Occur Under Primary Use Airspace and on Ranges[1]

Common Name (Scientific Name)	***Federal Status***	***Beak***	***Talon***	***Pecos***	***Cato***	***McGregor***	***WSMR (Yonder, Lava West, Red Rio, Oscura, Mesa, R-5107s)***	***IR-133/142***	***IR-192/194***	***IR-134/195***	***Aux. Field - RIAC***	***Aux. Field - Biggs AAF***
Mexican gray wolf (*Canis lupus baileyi*)	N-E & Exp				X							
Meadow jumping mouse (*Zapus hudsonius luteus*)	C	X	X		X	X		X	X	X		
Gunnison's prairie dog (montane populations) (*Cynomys gunnisoni gunnisoni* and *C.g. zuniensis*)	C				X			X				
Least tern (interior population) (*Sterna antillarum*)	E	X	X	X	X	X	X	X	X	X	X	
Lesser prairie-chicken (*Tympanuchus pallidicinctus*)	C		X	X					X	X	X	
Yellow-billed cuckoo (Western U.S. Distinct Population Segment) (*Coccyzus americanus occidentalis*)	C	X			X		X	X				
Mexican spotted owl (*Strix occidentalis lucida*)	T	X+	X		X+	X+	X	X	X+	X+		
Northern aplomado falcon (*Falco femoralis septentrionalis*)	N-E & Exp	X	X		X	X	X	X	X	X		
Piping plover (*Charadrius melodus*)	T				X		X	X				
Southwestern willow flycatcher (*Empidonax traillii extimus*)	E	X	X	X	X	X	X	X	X	X	X	
Sprague's pipit *Anthus spragueii*	C								X			
Chiricahua leopard frog (*Rana chiricahuensis*)	T				X		X	X				
Sand dune lizard (*Sceloporus arenicolus*)	C		X	X					X	X	X	
Gila trout (*Oncorhynchus gilae*)	E				X		X					
Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) (NM)	C	X	X			X	X		X	X		
Pecos bluntnose shiner (*Notropis simus pecosensis*)	T		X	X					X+	X	X	
Pecos gambusia (*Gambusia nobilis*)	E		X	X					X	X	X	

Common Name (Scientific Name)	***Federal Status***	***Beak***	***Talon***	***Pecos***	***Cato***	***McGregor***	***WSMR (Yonder, Lava West, Red Rio, Oscura, Mesa, R-5107s)***	***IR-133/142***	***IR-192/194***	***IR-134/195***	***Aux. Field - RIAC***	***Aux. Field - Biggs AAF***
Rio Grande silvery minnow (*Hybognathus amarus*)	E				X		X	X				
Noel's amphipod (*Gammarus desperatus*)	E		X	X					X	X	X	
Socorro isopod (*Thermosphaer- oma thermophilus*)	E				X		X	X				
Alamosa springsnail (*Psuedotryonia alamosae*)	E				X		X	X				
Chupadera springsnail (*Pyrgulopsis chupaderae*)	C				X		X	X				
Koster's springsnail (*Juturnia kosteri*)	E		X	X					X	X	X	
Pecos assiminea snail (*Assiminea pecos*)	E		X	X					X	X	X	
Roswell springsnail (*Pyrgulopsis roswellensis*)	E		X	X					X	X	X	
Socorro springsnail (*Pyrgulopsis neomexicana*)	E				X		X	X				
New Mexico hot springsnail (*Pyrgulopsis thermalis*)	C				X							
Gila springsnail (*Pyrgulopsis gilae*)	C				X							
Texas hornshell (mussel) (*Popenaias popei*)	C		X						X	X		
Gypsum wild buckwheat (*Eriogonum gypsophilum*)	T		X						X+	X		
Kuenzler hedgehog cactus (*Echinocereus fendleri* var. *kuenzleri*)	E	X	X	X		X	X	X	X	X	X	
Lee pincushion cactus (*Escobaria [Coryphantha] sneedii* var. *leei*)	T		X						X	X		
Pecos sunflower (*Helianthus paradoxus*)	T		X	X	X		X	X	X	X	X	
Sacramento Mountains thistle (*Cirsium vinaceum*)	T	X	X			X	X		X	X		
Sacramento prickly poppy (*Argemone pleiacantha* ssp. *pinnatisecta*)	E	X	X			X	X		X	X		
Sneed pincushion cactus (*Escobaria [Coryphantha] sneedii* var. *sneedii*)	E						X					
Todsen's pennyroyal (*Hedeoma todsenii*)	E	X	X			X	X		X	X+		

[1] Based on NMDGF BISON-M occurrence data for one or more counties underlying the airspace (species may not actually occur in the portion of the county under the airspace or near auxiliary airfield). If more-precise GIS data were available, they were also used.

Key: C=candidate species for listing under the ESA; E=listed as endangered under the ESA; N-E & Exp=nonessential/experimental (reintroduced) population; T=listed as threatened under the ESA; X+=USFWS-designated critical habitat present on lands beneath this airspace.

Source: Holloman AFB 2006; NMDGF 2009; NMRPTC 1999; WSMR 2009a.

Species that occur under the project primary use airspace identified in Table HO 3.8–1 have been exposed to past and ongoing military overflights similar to those being proposed for this project. Because the project area is currently used airspace, many investigations of potential impacts on sensitive species have been conducted. Comprehensive reviews of threatened, endangered, and other special status species and communities that may occur under the MOA airspace associated with Holloman AFB were included in the INRMP (Holloman AFB 2008a), as well as other sources (Holloman AFB 2006; WSMR 2009a). Use of other ("occasional use") airspace by F-35A is expected to be incidental and minor compared to the proposed use of primary use airspace by F-35A identified in Table HO 3.8–1, and occasional use airspace is not evaluated further in this document.

Considering the nature of the proposed uses of the project airspace, the nature of their distribution and habitats, and the fact that no new ground disturbance would occur under airspace or on ranges where similar disturbance has not already occurred, no effects are anticipated on the reptiles, amphibians, fish, invertebrates, or plant species listed in Table HO 3.8–1 or to their associated habitats. For these reasons, further discussion of these species, with the exception of Todsen's pennyroyal, is not included. Todsen's pennyroyal populations occur on WSMR under Yonder airspace unit, portions of which are used for live-fire air-to-air training. Limited high-elevation air-to-air gunnery training may be conducted by F-35A at towed aerial targets within Yonder airspace unit. Each F-35A carries non-explosive cannon rounds about 1 inch (25 millimeters) in diameter. There is a very low and discountable potential for spent rounds to reach the ground within a Townsend's pennyroyal colony, given the large size of the airspace and the small size and localized nature of the pennyroyal habitats. However, should one or more of these non-explosive rounds land within a pennyroyal population, it would have a localized effect at most. An expended round would be unlikely to affect the viability of a single individual, which typically consists of many stems connected by an underground network of rhizomes and can spread out over a considerable area (USFWS 2001). Moreover, a falling round would not cause soil erosion, fire, or otherwise adversely affect the pennyroyal's habitat. Designated critical habitat for the pennyroyal occurs on WSMR outside the area within which an expended round would fall (WSMR 2009b). Effects on this species would be less than significant and consistent with a "may affect, not likely to adversely affect" finding under the Endangered Species Act. USFWS (2009a) concurred with a finding of "may affect, not likely to adversely affect" Todsen's pennyroyal for similar training involving F-22s, which are no longer stationed at Holloman AFB.

The species that could possibly be affected by the proposed project actions include some birds and large mammals at sensitive life stages (such as during breeding or during severe winters). These species are discussed in more detail below.

Mexican Gray Wolf. The Mexican wolf (a subspecies of the gray wolf) once roamed throughout vast portions of Arizona, New Mexico, Texas, and Mexico. However, as human settlement intensified across the southwestern United States in the early 1900s, wolves increasingly came into conflict with livestock operations and other human activities (USFWS 2010). Federal, state, and private extermination campaigns were waged against the wolf until, by the 1970s, the Mexican wolf had been all but eliminated from the United States and Mexico. The Mexican wolf subspecies was listed as endangered under the ESA in 1973, and in 1978, the entire gray wolf species (outside of Minnesota and Alaska) was included under the endangered listing. The United States and Mexico agreed to establish a bi-national captive

breeding program with several wolves trapped in Mexico between 1977 and 1980 (USFWS 2010). USFWS approved the Mexican Gray Wolf Recovery Plan in 1982 and in 1998, captivity-reared Mexican wolves were released to the wild for the first time in the Blue Range Wolf Recovery Area, which includes habitat under a portion of the proposed project airspace (i.e., Cato MOA).

Interior Least Tern. The interior population of the least tern is listed as endangered under the ESA. The least tern is the smallest member in the tern family and nests in colonies in unvegetated alluvial sand or gravel bars or islands. Bare shorelines of saline lakes also are used for nesting, as well as manmade sites, such as sand and gravel pits and dredge islands. Historically, the interior least tern bred along many major western rivers, but nest sparsely along only five rivers today. The species began to decline at the turn of the 20th century when hunted for their feathers. Current threats to the interior least tern are habitat loss and modification due to water management for flood control, navigation, and irrigation. Changes in natural water regimes, including the creation of reservoirs, have resulted in the alteration or loss of nesting sandbars and river islands. Stabilization of water levels and the loss of annual scouring flows have favored the development of woody shoreline vegetation, thereby creating unsuitable nesting habitats for the interior least tern (USFWS 1990). Human disturbance within nesting colonies is also a concern. Occurrences of this species have been recorded in counties in which WSMR, McGregor Range, and the Beak and Talon MOAs occur.

Lesser Prairie-Chicken. This medium-sized, non-migratory grouse became a candidate for Federal listing in 1997. Subsequent USFWS reviews have upheld its "warranted but precluded" for listing status. The lesser prairie-chicken occupies mixed grass-dwarf shrub and the shinnery oak-bluestem communities in eastern New Mexico and small portions of four surrounding states. The lesser prairie-chicken may form flocks of up to 80 individuals in fall and winter, but spread out into territories in spring. Leks (breeding grounds) typically occur on knolls or low ridges with relatively short and/or sparse vegetation; some lekking behavior occurs on manmade areas such as well pads (NatureServe 2010). Males exhibit high fidelity to leks between breeding seasons and may defend these habitats all year. Nests are usually made in sand sagebrush or shinnery oak grasslands with high canopy cover. Most habitats occupied by prairie-chickens occur on private lands. Threats to this species include habitat removal and fragmentation due to energy development (including wind and solar) and other types of development.

Western Population of the Yellow-Billed Cuckoo. The two subspecies of yellow-billed cuckoo (eastern and western) are considered geographically separated by the Continental Divide (USFWS 2009b). The western Distinct Population Segment of the yellow-billed cuckoo was accepted as a candidate species under the ESA in 2001. Western yellow-billed cuckoos are migrants that prefer open woodlands with clearings and thick, scrubby undergrowth along watercourses (USFWS 2009b). Nesting occurs almost exclusively close to water. Canopy cover of at least 50 percent in both the understory and overstory is preferred, according to habitat models established for the western population. Based on historical accounts, this cuckoo was once considered locally common along a few river systems in New Mexico. Because of extensive riparian habitat loss, the overall range of the western yellow-billed cuckoo has decreased dramatically (USFWS 2009b). A 1986 study showed a 93 percent decline in population from the baseline 1975–1979 Lower Colorado River Valley population inventory, with additional documented declines in other areas (USFWS 2009b). It is likely that the largest

contributor to the decline of cuckoo habitat in the western United States is habitat loss and the alteration attributable to management of the flow regimes of the major rivers that support riparian habitat.

Mexican Spotted Owl. The secretive Mexican spotted owl, ESA-listed as threatened, prefers to nest and roost in closed-canopy, old-growth coniferous forests or rocky canyons. Mexican spotted owls may also nest on cliff ledges, in caves, in stick nests built by other birds, on debris platforms in trees, and in tree cavities. Federally designated critical habitat for the Mexican spotted owl occurs in patches within the forested regions of eastern Arizona and western New Mexico. A GIS analysis overlaying this designated critical habitat with proposed project airspace revealed that approximately 492,559 acres of spotted owl critical habitat occur under proposed training airspace. Critical habitat was mapped on lands below the Cato and Beak MOAs and on lands associated with Lincoln National Forest under the Ancho/Cowboy ATCAAs. Stand-replacing wildfire is considered the greatest current threat to the species (USFWS 2011a) and is related to forest management practices. Primary constituent elements of the critical habitat relate to forest structure, maintenance of adequate prey species, and canyon habitat (USFWS 2011a).

Piping Plover. Piping plovers are divided into three breeding populations: the Northern Great Plains, Great Lakes, and Atlantic Coast populations (USFWS 2002a). The Great Lakes population is listed as endangered under the ESA, whereas the Northern Great Plains and Atlantic Coast populations are listed as threatened. Piping plovers have been reported in New Mexico on only seven occasions, most recently in April 2001, and they are not considered to be a breeding species in New Mexico (NMDGF 2008; Williams 2001). The nearest breeding records are from southeastern Colorado (NMDGF 2008). These plovers nest on pebbly mud found near interior alkali lakes, ponds, and wetlands adjacent to sparsely vegetated areas. Habitat occupancy and nest-site fidelity appear to be variable and dependent on hydrologic cycles. The quality of adjacent upland habitats is also important for maintaining water quantity and quality and protection from disturbance and predators. This species is migratory, occurring in northern regions from late March through August. This population is threatened by changes in natural water regimes resulting in the alteration or loss of nesting sandbars and river islands, as described for the interior least tern. Occurrences of this species have been recorded in counties underlying the Cato MOA and WSMR airspace.

Southwestern Willow Flycatcher. Willow flycatchers (*Empidonax traillii*) are fairly common throughout the southwest during migration, but the endangered southwestern willow flycatcher (SWFL) subspecies (*E.t.* subsp. *extimus*) only occurs during breeding season, when it chooses dense, riparian habitats in a few scattered drainages in western New Mexico (WSMR 2009a) and elsewhere in the southwestern states. The historic breeding range of the SWFL is considered to have been primarily from the Rio Grande Valley westward, including the Rio Grande, Chama, Zuni, San Francisco, and Gila watersheds (USFWS 2002b). Willow flycatchers may occur on WSMR, but have not been recorded to nest there (WSMR 2002). Occurrences of the species have been mapped in counties that occur below all of the airspace units. However, none of the designated critical habitat for the SWFL was mapped to occur directly under the proposed project airspace, even though the SWFL may occur in those underlying suitable habitats during the breeding season.

Northern Aplomado Falcon. Historically, the northern aplomado falcon was infrequently observed in the project area and the species had not bred in the south–central New Mexico region since the early 1950s (Corral et al. 2001; WSMR 2002). The nearest known breeding population was in northern Chihuahua, Mexico, about 125 miles south of Fort Bliss, Texas (Corral et al. 2001). The species does not have federally designated critical habitat; however, suitable habitat for this species does exist under the proposed F-35A training airspace (USFWS 2006, 2009b). The Air Force has worked with USFWS on the reintroduction of northern aplomado falcons into southern New Mexico and Arizona with the purpose of establishing a viable resident population. Captive-bred northern aplomado falcons have been released in New Mexico on public and private lands and in Texas (WSMR 2009c). The reintroduced populations are designated by USFWS as nonessential/experimental in New Mexico and Arizona according to Section 10(j) of the ESA of 1973, as amended. A few individual northern aplomado falcons have been observed on McGregor Range (Army 2001). WSMR has entered into a cooperative agreement with The Peregrine Fund with the intent to continue this project until this species is recovered and delisted. USFWS did not expect conflicts between falcon management and agricultural, oil and gas development, military, or recreational activities in the area (WSMR 2002).

Sprague's Pipit. USFWS reviewed the conservation status of Sprague's pipit in 2010 and determined that the species warrants protection under the ESA but that listing as threatened or endangered at this time is precluded by the need to complete other listing actions of a higher priority (USFWS 2011b). Thus, the species currently has Federal candidate status. Sprague's pipit is a relatively small bird endemic to the North American grasslands. The species is closely tied with native prairie habitat and breeds in the north-central United States, as well as south-central Canada (USFWS 2011b). Wintering for Sprague's pipits occurs in Arizona, Texas, Oklahoma, Arkansas, Mississippi, Louisiana, and New Mexico. This species has been recorded as occurring in counties under IR-192/194.

Auxiliary Airfields

Biggs AAF. Reintroduced populations of aplomado falcon may occur on Fort Bliss, but breeding birds have not yet been identified there and are not expected near the airfield. Fort Bliss has a 2001 INRMP (in the process of revision), frequently monitors on-base species, and has developed detailed Endangered Species Management Plans that provide protection for the sensitive species present. Being a heavily urban area with much disturbed ground and human activity, no sensitive species are known to or expected to occur in or around Biggs AAF.

EPIA. Located adjacent to and essentially surrounded by Fort Bliss and Biggs AAF, EPIA is a currently active commercial and general aviation airport supporting the region's air traffic. Because the airport is primarily fully developed, land cover would be essentially the same as described for Biggs AAF, including barren areas or areas supporting only nonnative species. Wildlife species that tolerate the high human activity in the area would include common urban species of the southwest, such as those listed for Holloman AFB, that likely roost and nest in residential neighborhoods to the south.

RIAC. Vegetation and wildlife species expected in the RIAC area would be somewhat similar to those described for Holloman AFB, especially species tolerant of human presence and disturbance. RIAC is currently operating as a civilian airport and as a storage location for a large number of mothballed airliners. The airfield environment is mostly built up and contains

little or no undisturbed habitat. In an Environmental Assessment for additional development at RIAC, the interior least tern was described as a "regular" occurrence in Chaves County (Air Force 1989). As described above, this species requires perennial water for nesting, which does not occur at RIAC. The most abundant population of this endangered species in the vicinity breeds at the Bitter Lakes NWR about 15 miles from RIAC. The other sensitive species indicated in Table HO 3.8–1 that may occur at RIAC were listed for Chaves County and do not necessarily imply presence near RIAC; none are known to occur there. Because RIAC is an active airfield within an urban community, special status species are not expected to be present there.

HO 3.8.2.2 Airspace Environmental Consequences

The potential for adverse effects of F-35A training in the airspace and at the auxiliary airfields on endangered, threatened, or special status wildlife is minimal, as described above for vegetation and wildlife (see Section HO 3.1.2.3). Because effects on a single individual of a federally listed endangered or threatened species could be significant, however, a more-detailed consideration of impacts is required for these species. In the analysis that follows, the focus is on the activities of the aircraft in airspace overlying habitat that may be occupied by endangered or threatened species and a comparison with existing conditions, including aircraft activity in the same locations. This is followed by a species-by-species synopsis of potential effects.

All F-35A flight activities would take place in existing airspace; therefore, no airspace modifications would be required. Activities required for the F-35A on training ranges and in airspace would be similar to existing or recent past use of the airspace by F-16s, German Air Force (GAF) Tornadoes, and F-22s. Proportionately more of the F-35A sorties would occur at higher altitudes than F-16 sorties, which is expected to reduce the potential to startle wildlife and domestic animals with noise and the sudden appearance of overflying aircraft. F-35As conduct most of their operations at high altitudes, like the F-22 (see Table HO 2.2–5), but generate less frequent sonic booms than were generated by the F-22s. As shown in Table HO 2.2–5, the altitudes at which the F-35As would train would be similar to the altitudinal profile of the F-22s and generally higher than that of F-16s. At the altitudes where the F-35A would spend most of its time, overflight noise (as perceived from the ground) would increase relatively gradually from ambient to the peak noise level. Overflight events at these altitudes would not be expected to be startling to animals or to have other adverse impacts. Guided munitions used for F-35A training would be expected to be released from higher altitudes than conventional munitions employed by existing aircraft using the training ranges. Their use would be confined to existing target areas within existing restricted airspace.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training (see Table HO 2.2–2). Supersonic flight is not authorized on MTRs or in the Beak or Talon MOAs; however, supersonic flight is authorized in the ATCAA that overlies the Beak MOA. Sonic booms generated by F-35A aircraft are expected to be less intense than sonic booms generated by the F-22, which was based at Holloman AFB until recently. At a given altitude, overpressures associated with an F-35A sonic boom in straight and level flight at Mach 1.2 are approximately 90 percent as large as those produced by the F-22 and 10 to 20 percent larger than those produced by the F-16 (from data in Table HO 3.2–6). Under Scenarios H1W, H2W, and H3W, the proposed F-35A sortie-operations

would incrementally increase the average number of sonic booms experienced near the center of the training airspace units by 0 to 0.3 per day. Under Scenarios H1, H2, H3, H4, and H5, the average number of sonic booms per day would decrease or remain the same as under baseline conditions except over the McGregor Range, where the number of sonic booms per day would increase by up to 0.1 per day.

Table HO 3.8–2 provides a species-specific assessment of potential effects on endangered, threatened, and sensitive species in the ROI.

Table HO 3.8–2. Potential Effects on Federally Listed, Proposed, and Candidate Species That May Occur Under Primary Use Airspace and on Ranges

Species[1]	*Potential Presence in Project ROI*	*Potential Adverse Effects*
Mexican gray wolf	Widely dispersed in remote areas on national forest lands under the airspace at the Arizona–New Mexico border.	The Mexican gray wolf was reintroduced to remote, forested areas near the Arizona–New Mexico border and these populations are designated by USFWS as nonessential/experimental (N-E & Exp) populations. Under N-E & Exp status, no formal ESA Section 7 consultation is required regarding potential impacts of land uses on these populations. Overflight by F-35A aircraft would represent a minimal departure from baseline conditions and is not expected to adversely affect the Mexican gray wolf or its habitat under the airspace.
Least tern (interior population)	Sparse presence near perennial waters with sandbars under airspace and Instrument Routes. Nesting colony within 15 miles of RIAC.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions with regard to species under the airspace. F-35A overflight is not expected to adversely affect the interior least tern or its habitat under the airspace. The potential for 'take' in the form of disturbance (i.e., harassment) from low-flying aircraft is extremely low because of the localized nature and seasonality of the tern populations and the minimal percentage of time spent by F-35A in low-level flight. Any impacts of overflight would not reach the scale at which take would occur. Additionally, the potential for a bird–aircraft strike involving this small, low-flying species is so low as to be discountable. Terns nesting at Bitter Lakes NWR, about 15 miles northeast of RIAC, could be near the flightpath of F-35A aircraft on approach to the airport. At this distance from the airport, the vertical separation would be 3,000 feet or more, and noise and visual appearance of the aircraft would be minimized by that separation as well as the horizontal separation (the flight path passes south of the Bitter Lakes NWR). Additionally, because of the location of this area near an approach pattern, individuals present would have had a history of exposure to and habituation to aircraft overflight. An individual that responded to overflight would be most likely to briefly assume an alert posture and then quickly resume normal activities. Based on (1) the very low percentage of time spent in low-level flight by F-35As training within the airspace and (2) the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, no adverse effects on the interior least tern, from overflights or noise are anticipated to be associated with the addition of F-35A training.
Lesser prairie-chicken	Present in counties under eastern MOAs and Instrument Routes and in which RIAC occurs.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions, and slight changes in the noise environment are not expected to adversely affect the lesser prairie-chicken or its habitat under the airspace. Any impacts of overflight would not reach the scale at which take would occur. This bird is a low-flying species, and the potential for a bird–aircraft strike is so low as to be discountable.

Species[1]	*Potential Presence in Project ROI*	*Potential Adverse Effects*
Yellow-billed cuckoo (Western U.S. Distinct Population Segment)	Breeds in dense riparian habitats; very localized under airspace and IR-133/142.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions, and slight changes in the noise environment would not reach the scale at which take would occur. The yellow-billed cuckoo's preferred habitat of thick, riparian canopy cover is expected to minimize or eliminate any visual appearance of an overflying aircraft. The potential for a bird–aircraft strike is so low as to be discountable.
Mexican spotted owl (MSO)	Limited, specific habitat located in montane forests and canyons under airspace and MTRs.	The potential for overflight impacts on MSO has been studied in some detail. MSO did not flush from a nest or perch unless a helicopter was as close as 330 feet (Delaney et al. 1997). F-16 overflights produced minimal responses at elevations of about 2,000 feet above MSOs (Johnson and Reynolds 2002). It was also noted that MSO responses to the F-16 overflights were often less dramatic than responses to naturally occurring events, such as thunderstorms. Supersonic flight is not authorized on MTRs, including the VRs that cross MSO habitat. A 6-year study conducted by Air Combat Command (ACC 2008) during April through July from 2000 through 2005 found that aircraft overflight had no effect on occupancy of MSO activity centers and found no correlations among measures of aircraft exposure and nesting success. Additionally, no flushing or loss of adults or young was observed in response to any aircraft overflights, including 40 observations of military jet aircraft overflight that came within 500 feet of owls. Based on these results, overflight by F-35A aircraft at 500 feet AGL and above is not expected to reach the scale at which take would occur. In addition, the chance of accidental MSO-aircraft strike is so unlikely as to be discountable. Use of defensive flares is not authorized on MTRs, and the project would not adversely modify MSO critical habitat or its primary constituent elements.
Northern aplomado falcon	Sparse recovery populations under airspace and MTRs.	This species was reintroduced to limited, remote grassland habitats in southern New Mexico, Arizona, and Texas and has N-E & Exp status with USFWS. Therefore, no formal ESA Section 7 consultation is required regarding potential impacts of land uses on these populations. Any occurrences near airfields where low-level flight would be most frequent would be extremely rare and incidental; therefore, the potential for a bird–aircraft strike is so low as to be discountable. No adverse effects on the northern aplomado falcon or its habitat from F-35A training associated with the F-35A beddown are expected.
Piping plover	Rarely recorded adjacent to limited perennial water habitats under airspace and MTRs.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions and a slight change the noise environment, but is not expected to adversely affect the piping plover or its habitat that may occur under the airspace. This bird is a small, low-flying species, and the potential for a bird–aircraft strike is so low as to be discountable.
Southwestern willow flycatcher (SWFL)	Breeds in dense riparian habitats and is very localized under airspace and MTRs.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions, and slight changes in the noise environment are not expected to adversely affect the SWFL. Its preferred habitat of thick, riparian canopy cover is expected to minimize or eliminate any visual appearance of an overflying aircraft. The potential for a bird–aircraft strike is so low as to be discountable.

[1] See Table HO 3.8–1 for species status and additional information on distribution with respect to areas proposed for use for F-35A training.

In conclusion, although it is possible for a federally listed, proposed, or candidate wildlife species to exhibit a temporary response to a low-level overflight or sonic boom, such as assuming an alert posture, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which "take" occurs (as defined in the ESA). The probability of a bird–aircraft strike involving injury to a listed, proposed, or candidate species is so low as to be discountable. Therefore, impacts of the project

on listed, proposed, or candidate species and their habitat would be less than significant. These circumstances are consistent with "may affect, not likely to adversely affect" listed or proposed species and "would not adversely modify critical habitat" determinations under the ESA. In the event that Holloman AFB becomes the Preferred Alternative, the Air Force will submit these findings to USFWS and seek its concurrence with this determination in compliance with the ESA.

HO 3.9 Cultural Resources (Archaeological, Architectural, Traditional, Native American Consultation)

For purposes of compliance with Section 106 of the National Historic Preservation Act (NHPA) and in accordance with 36 CFR Section 800.4(a)(1), the area of potential effect (APE) under the Holloman AFB alternative has been defined. The APE for direct and indirect impacts is considered to be Holloman AFB, which comprises approximately 8,000 acres within the southern portion of the base. Actual potential construction impacts would involve a much smaller area; auxiliary airfield RIAC, as shown in Figures HO 3.2–14 through HO 3.2–18; auxiliary airfield Biggs AAF and EPIA, as shown in Figures HO 3.2–9 through HO 3.2–13; and the MOA/ATCAAs, MTRs, and Restricted Areas shown as primary use airspace in Figure HO 2.2–1. The definition of cultural resource and methodology for analysis are described in Chapter 3, Section 3.7.

HO 3.9.1 Base

HO 3.9.1.1 Base Affected Environment

Archaeological Resources. Approximately 57,600 acres of Holloman AFB have been surveyed for cultural resources. This represents about 96 percent of the base's 59,639 acres. Most of the survey is a result of projects between 1993 and 1997 (Holloman AFB 2010a). The unsurveyed acres are entirely within the disturbed and built environment of Holloman AFB. Through these surveys, 363 archaeological resources have been identified on base and base-administered lands. Of the 363 recorded sites, 250 are located on the main base and the remainder is located on the BWWSA.

Of the 250 archaeological resources located on the main area of Holloman AFB, 135 are associated with the activities of indigenous populations, distributed between four recognized time periods spanning almost 12,000 years. There are an additional 23 historic properties attributable to the historic period that are primarily associated with ranching, 49 cultural resources related to the military presence in the Tularosa Basin, and 41 cultural resources that have both an indigenous and a historic component. Two of the cultural resources are isolated thermal features with no associated artifacts, which, without testing, cannot be categorized (Holloman AFB 2010a).

Thirty-five of the archaeological resources on the main area of Holloman AFB have been evaluated as eligible for listing in the National Register of Historic Places (NRHP), 142 are potentially eligible, and 73 are considered ineligible (Holloman AFB 2010a).

Historic Architectural Resources. Currently, there are 1,474 architectural resources on Holloman AFB (Holloman AFB 2010a). Of these, 60 are recognized as being associated with World War II (pre-1946), 1,392 are related to the Cold War period (1946 to 1989), and 22 are Premilitary Historic Era architectural resources. Of these, 29 are considered eligible for inclusion in the NRHP, 18 are potentially eligible, 50 are considered ineligible, and 1,377 remain unevaluated (Holloman AFB 2010a; see Appendix C, Tables C–5, C–6, and C–7). Of these, 14 are considered to have the potential to be designated as an NRHP Missile Test Stands Historic District.

Premilitary Historic-Era architectural resources were assessed on Holloman AFB (Holloman AFB 2010a). Of the 22 European-American settlements recorded, 1 is eligible for listing in the NRHP, 18 are potentially eligible and should be revisited to determine their eligibility for listing in the NRHP and architectural preservation needs (see Appendix C, Table C–5), and 3 are ineligible and require no further consideration (Holloman AFB 2010a).

In the area surrounding Holloman AFB, the most notable historic cultural resource is the WHSA Visitor Center. This complex of seven buildings, constructed between 1936 and 1940, is officially listed as the WHSA Historic District. The main visitor's center is an adobe structure that could potentially be damaged by noise and vibrations. This structure, built between 1936 and 1940, is constructed in a traditional southwest Pueblo style using adobe bricks and a flat, horizontal roof supported by "large, exposed log beams or vigas" (King et al. 1988). A study of the visitor center (King et al. 1988) identified "low-flying helicopters and low-flying, high-speed jet aircraft" as well as "road construction or heavy earth-tamping" as potential sources of damage from vibration.

Traditional Cultural Resources. Native American groups with historic ties to the area, such as the Mescalero Apache, have not identified any traditional cultural properties (TCPs) on Holloman AFB (Holloman AFB 2010a). Holloman AFB continues to consult with the Mescalero Apache.

HO 3.9.1.2 Base Environmental Consequences

There are a total of eight aircraft beddown scenarios for consideration under this alternative. Each scenario is considered below in sequence ascending from the lowest (24 PAA) to the highest (120 PAA).

Scenario H1. Under this scenario, projected construction and renovation projects required include construction of 15 new buildings, facilities, associated infrastructure, and additions or alterations to 1 existing facility (see Table HO 2.1–3).

Impacts on archaeological resources are not expected under this scenario. Although surveys have documented 250 archaeological resources in the main area of Holloman AFB, none are within the ROI of any of the proposed construction projects. However, it is possible that project–related, ground-disturbing activities could encounter previously unknown and unevaluated cultural resources, even underneath existing development. In the event that previously unrecorded or unevaluated cultural resources are encountered during construction, Holloman AFB would manage these resources in accordance with the Holloman AFB Integrated

Cultural Resources Management Plan (ICRMP), adhering to Federal and state laws, as well as Air Force regulations.

Indirect impacts on archaeological resources at Holloman AFB due to personnel changes are not anticipated, as the on-base population is expected to decrease (see Table HO 2.1–4).

Although no building demolitions are planned as a result of the F-35A beddown, impacts on architectural resources could occur under this scenario. Holloman AFB has 29 buildings considered eligible for inclusion in the NRHP, 18 considered potentially eligible, and 1,377 that remain unevaluated. Prior to project implementation, the structure planned for renovation would need to be evaluated for possible inclusion in the NRHP. New construction or renovation could result in adverse impacts if any of the affected buildings are found to be NRHP eligible. Unevaluated buildings determined to be potentially eligible for listing in the NRHP in the project area would be addressed in compliance with Section 106 of the NHPA prior to construction or renovation.

Projected noise in the vicinity of the WHSA Visitor Center would be similar to existing conditions, with no increase in noise levels around the Visitor Center. The Visitor Center would not experience any effect from the F-35A beddown.

Impacts on traditional cultural resources are unlikely under this scenario, as no Native American TCP or traditional cultural resources at the installation have yet been identified. In the event that previously unrecorded or unevaluated traditional cultural resources are encountered during construction, Holloman AFB would manage these resources in accordance with the Holloman AFB ICRMP, adhering to Federal and state laws, as well as Air Force regulations.

Scenario H2. Under this scenario, projected construction and renovation projects required would be similar to those described for Scenario H1 with construction of three additional buildings, facilities, and their associated infrastructure (see Table HO 2.1–3). The small increase in on-base personnel is not expected to result in indirect impacts on archaeological resources at Holloman AFB. Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario H1, but with slightly more ground disturbance.

Scenario H3. Under this scenario, projected construction and renovation projects required would be similar to those described for Scenario H1 with renovation of two buildings and construction of 13 additional buildings, facilities, and their associated infrastructure (see Table HO 2.1–3). The small increase in on-base personnel is not expected to result in indirect impacts on archaeological resources at Holloman AFB. Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario H1, but with more ground disturbance.

Scenario H4. Under this scenario, projected construction and renovation projects required would be similar to those described for Scenario H1 with construction of 18 additional buildings, facilities, and their associated infrastructure and renovations or additions to two buildings (see Table HO 2.1–3). The increase of on-base personnel by approximately 19 percent is not expected to result in indirect impacts on archaeological resources at Holloman AFB.

Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario H1, but with more ground disturbance.

Scenario H5. Under this scenario, projected construction and renovation projects required would be similar to those described for Scenario H1 with construction of 22 additional buildings, facilities, and their associated infrastructure and renovation or additions to two buildings (see Table HO 2.1–3). The increase of on-base personnel by approximately 27 percent is not expected to result in indirect impacts on archaeological resources at Holloman AFB. Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario H1, but with more ground disturbance.

Scenario H1W. Under this scenario, projected construction and renovation projects required include construction of 31 new buildings or facilities, 500 new family housing units, and associated infrastructure (see Table HO 2.1–2). Impacts on archaeological and traditional cultural resources would be similar to those described for Scenario H1.

Although no building demolitions or renovations are planned under Scenario H1W, impacts on architectural resources could occur under this scenario. Holloman AFB has 29 buildings considered eligible for inclusion in the NRHP, 18 considered potentially eligible, and 1,377 that remain unevaluated. New construction could result in adverse impacts if any of the affected buildings are found to be NRHP eligible. Unevaluated buildings determined to be potentially eligible for listing in the NRHP in the project area would be addressed in compliance with Section 106 of the NHPA prior to construction or renovation.

Impacts on archaeological resources are not expected under this scenario. Although surveys have documented 250 archaeological resources in the main area of Holloman AFB, none are within the ROI of any of the proposed construction projects. However, it is possible that project–related, ground-disturbing activities could encounter previously unknown and unevaluated cultural resources, even underneath existing development. In the event that previously unrecorded or unevaluated cultural resources are encountered during construction, Holloman AFB would manage these resources in accordance with the Holloman AFB ICRMP, in compliance with Federal and state laws, as well as Air Force regulations.

The small increase in on-base personnel is not expected to result in indirect impacts on archaeological resources at Holloman AFB.

Scenario H2W. Under this scenario, projected construction and renovation projects required would be similar to those described for Scenario H1W with construction of three additional buildings, facilities, and their associated infrastructure (see Table HO 2.1–2). The increase of on-base personnel by approximately 19 percent is not expected to result in indirect impacts on archaeological resources at Holloman AFB. Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario H1W, but with slightly more ground disturbance.

Scenario H3W. Under this scenario, projected construction and renovation projects required would be similar to those described for Scenario H1W with construction of six additional

buildings, facilities, and their associated infrastructure (see Table HO 2.1–2). The increase of on-base personnel by approximately 27 percent is not expected to result in indirect impacts on archaeological resources at Holloman AFB. Therefore, anticipated impacts on archaeological, historic architectural and traditional cultural resources would be similar to those described for Scenario H1W, but with slightly more ground disturbance.

HO 3.9.2 Airspace

HO 3.9.2.1 Airspace Affected Environment

Table HO 3.9–1 presents the NRHP-listed sites and Indian Reservation lands under the various blocks of training airspace associated with Holloman AFB. The Holloman AFB training airspace overlies at least part of 12 New Mexico counties (Catron, Chaves, De Baca, Doña Ana, Eddy, Guadalupe, Lincoln, Otero, Roosevelt, Sierra, Socorro, and Torrance) and 2 Texas counties (Culberson and Hudspeth). Eighty-seven NRHP-listed properties have been identified under airspace associated with Holloman AFB (see Appendix C, Table C–8). In addition, many more eligible or potentially eligible cultural resources associated with the history of the region are likely to underlie airspace. Archaeological sites under the airspace include native burials, village and settlement sites, historic trails, battle sites, and historic mining sites (Holloman AFB 2010a). Architectural resources under the primary use MOAs, ATCAAs, and ranges include structures relating to mining, ranching, settlement, the railroad, and the military (Holloman AFB 2010a). The documented, historic trails that crisscross New Mexico span the period from the first Spanish explorers to the twentieth century. Many of these routes followed Native American travel and trading roads that long pre-dated the historic period.

Table HO 3.9–1. NRHP-Listed Sites and Indian Reservation Lands Under Holloman AFB Training Airspace

Airspace Designation	*Number of NRHP Properties Under Airspace*[1]	*Indian Reservation Lands Under Airspace*
Beak A/B/C/ MOA/Overlying ATCAA(s)	8	Mescalero Apache Indian Reservation
Pecos MOA/Overlying ATCAA(s)	4	None
Cato MOA/Overlying ATCAA(s)	16	None
Talon MOA/Overlying ATCAA(s)	21	None
Ancho ATCAA	23	Mescalero Apache Indian Reservation
Cowboy ATCAA	31	Mescalero Apache Indian Reservation
R-5107 (Red Rio-WSMR)	0	None
R-5107 (Oscura-WSMR)	0	None
R-5107 (Lava E/W-WSMR)	2	None
R-5107 (Mesa L/H-WSMR)	1	None
R-5107 (Yonder-WSMR)	5	None
R-5107D	1	None
R-5103 (McGregor-Fort Bliss)	3	None
IR-133/142	5	Mescalero Apache Indian Reservation
IR-134/195	6	None
IR-192/194	3	None

[1] More complete information concerning NRHP-listed properties (including state, county, nearest town) is found in Appendix C, Table C–8.

The Mescalero Apache Indian Reservation is under the Cowboy ATCAA and partially under the Beak MOAs. There are TCPs located within the reservation boundaries; it is likely that other resources in the area could qualify as TCPs, and there are many archaeological sites and natural features that may be considered traditional cultural resources. The exact location of all traditional cultural resources is confidential.

In addition to the trails mentioned under each airspace segment below, there are numerous other notable and historic trails that skirt the ROI. Many of these connected Santa Fe with points east and west. The Gila Trail originated in Arizona; the Santa Fe Trail ran north of the project area, as did the Old Spanish Trail, which linked Santa Fe with Los Angeles, California. The Turquoise Trail proceeded north from Santa Fe. Route 66 passed north of the airspace through Albuquerque and followed roughly the route taken by Edward Fitzgerald Beale and his Camel Corps (mid-nineteenth century U.S. Army experiment in using camels as pack animals in the American Southwest).

Auxiliary Airfields

RIAC, EPIA, and Biggs AAF. RIAC, EPIA, and Biggs AAF are identified as auxiliary airfields for F-35A aircraft based at Holloman AFB. A search of the National Register Information System database indicated that there are no NRHP-listed properties at any of the three auxiliary airfields (NRIS 2010).

HO 3.9.2.2 Airspace Environmental Consequences

There are a total of eight aircraft beddown scenarios for consideration under this alternative. Each scenario is considered in the following text in sequence ascending from the lowest PAA of 24 aircraft to the highest of 120 aircraft.

Scenario H1. Under this scenario, 24 F-35A aircraft would be bedded down at Holloman AFB and would train in the primary use airspace units described above and listed in Tables HO 2.2–2, HO 2.2–4, and HO 2.2–6.

Subsonic noise would increase somewhat under all of the airspace units except the Beak, Pecos, Cato, and Talon MOA/ATCAA(s) and the air-to-ground range restricted airspace at R-5107 (Mesa L/H) and R-5107 (Yonder). Subsonic noise under the centerlines of all of the MTRs associated with Holloman AFB would increase marginally to levels between 52 dB DNL_{mr} and 57 dB DNL_{mr}. Noise levels would not exceed 65 dB DNL_{mr} under any airspace unit under Scenario H1. Under Scenario H1, the number of sonic booms would decrease by between 3 and 15 booms per month or remain the same (see Table HO 3.2–4).

No impacts on historic properties under airspace associated with Holloman AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operation would be even less likely to cause damage (see Appendix B, Section B.2.8 and Section B.2.10). Ongoing use of airspace by F-16 and other military aircraft has not impacted historic properties. Although there would be an increase in

subsonic noise underneath 9 out of the 20 MOAs, MTRs, and restricted airspaces, it would not be of sufficient magnitude to impact historic properties under airspace. F-35As will typically operate at higher altitudes than the legacy aircraft, and impacts on historic properties from noise are not expected. Flare and inert munitions use is not expected to impact historic properties under airspace. Existing use of flares by legacy aircraft is not known to have impacted these resources; therefore, their use by F-35A aircraft also is not expected to result in impacts.

In compliance with Section 106 of the NHPA, the Air Force has completed consultation with the New Mexico and Texas SHPOs regarding potential impacts on cultural resources, and received concurrence that basing the F-35A training mission at Holloman AFB will have no effect on historic properties beneath training airspace (see Appendix C).

Native American Concerns. During the EIS public scoping process, the Air Force contacted the Acoma Pueblo, Alamo Navajo Chapter, Laguna Pueblo, Mescalero Apache Tribe, Ramah Navajo Chapter, and Zuni Pueblo to invite them to attend the public meetings and express their concerns about the potential F-35A beddown at Holloman AFB. During the scoping process, including the public meetings, no comments regarding potential impacts on traditional cultural resources or TCPs were received.

In accordance with Section 106 of the NHPA and Executive Order 13175, the Air Force also has contacted the Native American tribes listed in Appendix C to consult on a government-to-government basis regarding their concerns about potential impacts on traditional cultural resources and TCPs under airspace associated with Holloman AFB. The Air Force sent letters in November 2010 and 2011 and continued to follow up by telephone to ascertain each tribe's concerns (see Appendix C). The Mescalero Apache Tribe indicated in an oral response and the Isleta del Sur Pueblo indicated in a written response that they had no comments on the Air Force proposal. The Hopi Tribe responded in writing that they consider prehistoric archaeological resources as TCPs, and that unless additional surveys identify prehistoric cultural resources or any are inadvertently discovered, they would defer further consultation on the proposed project to the SHPOs and other interested tribes and parties.

Air Force consultation with interested Native American groups regarding airspace actions has determined that the slight increase in subsonic noise under fewer than half of the airspace units associated with Holloman AFB, as well as continued flare and inert munitions use, is not expected to result in impacts on traditional cultural resources (see Appendix C). The Mescalero Apache Indian Reservation is under the Cowboy ATCAA and partially under the Beak MOAs (see Figure HO 2.2–1). There are TCPs located within the reservation boundaries, and other traditional cultural resources are known to underlie this airspace. However, as stated above, the Mescalero Apache Tribe indicated in an oral response that it had no comments on the Air Force proposal.

Scenario H2. Under this scenario, 48 F-35A aircraft would be bedded down at Holloman AFB and would train in the primary use airspace units described above and listed in Tables HO 2.2–2, HO 2.2–4, and HO 2.2–6.

Subsonic noise would increase somewhat under all of the airspace units except the Cato and Pecos MOA/ATCAA(s), but would remain below 65 dB DNL_{mr}. The greatest subsonic noise

increase would occur under the air-to-ground range restricted airspace at R-5107 (Oscura-WSMR). Subsonic noise under the centerlines of all of the MTRs associated with Holloman AFB would increase marginally to levels between 53 and 59 dB DNL_{mr}. Under Scenario H2, the number of sonic booms per month would decrease by between 3 and 15 booms per month or remain about the same (see Table HO 3.2–4).

As under Scenario H1, no impacts on historic properties under airspace associated with Holloman AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-16 and other legacy aircraft has not impacted historic properties, and the incremental increase in noise, as well as continued flare and inert munitions, use is not expected to impact historic properties under airspace.

Native American Concerns. Native American concerns are similar to those described under Scenario H1 above. Likewise, potential impacts on traditional cultural resources under the airspace, particularly on the Mescalero Apache Indian Reservation that underlies airspace associated with Holloman AFB, would be similar to those described under Scenario H1. As stated above, the Mescalero Apache Tribe indicated in an oral response that it had no comments on the Air Force proposal.

Scenario H3. Under this scenario, 72 F-35A aircraft would be bedded down at Holloman AFB and would train in the primary use airspace units described above and listed in Tables HO 2.2–2, HO 2.2–4, and HO 2.2–6.

Subsonic noise would increase somewhat under all of the airspace units except the Cato and Pecos MOA/ATCAA(s), but would remain at or below 66 dB DNL_{mr}. The greatest subsonic noise increase would occur under the air-to-ground range restricted airspace at R-5107 (Oscura-WSMR). Subsonic noise under the centerlines of all of the MTRs associated with Holloman AFB would increase by 5 dB DNL_{mr} to levels between 54 and 60 dB DNL_{mr}. Under Scenario H3, the number of sonic booms per month would decrease by between 3 and 15 booms per month or remain about the same (see Table HO 3.2–4).

Like Scenario H1, no impacts on historic properties under airspace associated with Holloman AFB are expected under this scenario. As under Scenario H1, ongoing use of airspace by F-16 and other legacy aircraft has not impacted historic properties, and the incremental increase in noise, as well as continued flare and inert munitions use, is not expected to impact historic properties under airspace.

Native American Concerns. Native American concerns are similar to those described for Scenario H1 above. Likewise, potential impacts on traditional cultural resources under the airspace, particularly on the Mescalero Apache Indian Reservation that underlies airspace associated with Holloman AFB, would be similar to those described under Scenario H1. As stated above, the Mescalero Apache Tribe indicated in an oral response that it had no comments on the Air Force proposal.

Scenario H4. Under this scenario, 96 F-35A aircraft would be bedded down at Holloman AFB and would train in the primary use airspace units described above and listed in Tables HO 2.2–2, HO 2.2–4, and HO 2.2–6.

Subsonic noise would increase somewhat under all of the airspace units except the Cato and Pecos MOA/ATCAA(s), but would remain at or below 67 dB DNL_{mr}. The greatest subsonic noise increase would occur under the air-to-ground range restricted airspace at R-5107 (Red Rio-WSMR), R-5107 (Oscura-WSMR), R-5103 (McGregor), and R-5103 (Centennial Range-Fort Bliss). Subsonic noise under the centerlines of all of the MTRs associated with Holloman AFB would increase by 6 dB DNL_{mr} to levels between 55 and 61 dB DNL_{mr}. Under Scenario H4, the number of sonic booms per month would decrease by between 3 and 12 booms per month, increase by 6 per month, or remain about the same (see Table HO 3.2–4).

Like Scenario H1, no impacts on historic properties under airspace associated with Holloman AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-16 and other legacy aircraft has not impacted historic properties, and the incremental increase in noise, as well as continued flare and inert munitions use, is not expected to impact historic properties under airspace.

<u>Native American Concerns.</u> Native American concerns are similar to those described for Scenario H1 above. Likewise, potential impacts on traditional cultural resources under the airspace, particularly on the Mescalero Apache Indian Reservation that underlies airspace associated with Holloman AFB, would be similar to those described under Scenario H1. As stated above, the Mescalero Apache Tribe indicated in an oral response that it had no comments on the Air Force proposal.

Scenario H5. Under this scenario, 120 F-35A aircraft would be bedded down at Holloman AFB and would train in the primary use airspace units described above and listed in Tables HO 2.2–2, HO 2.2–4, and HO 2.2–6.

Subsonic noise would increase somewhat under all of the airspace units except the Cato and Pecos MOA/ATCAA(s), but would remain at or below 67 dB DNL_{mr}. The greatest subsonic noise increase would occur under the air-to-ground range restricted airspace at R-5107 (Red Rio-WSMR), R-5107 (Oscura-WSMR), R-5103 (McGregor), and R-5103 (Centennial Range-Fort Bliss). Subsonic noise under all of the Holloman AFB-associated MTRs would increase by 7 dB DNL_{mr} to levels between 56 and 62 dB DNL_{mr}. Under Scenario H5, the number of sonic booms per month would decrease by between 3 and 12 booms per month, increase by 6 per month, or remain the same (see Table HO 3.2–4).

As under Scenario H1, no impacts on historic properties under airspace associated with Holloman AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-16 and other legacy aircraft has not impacted historic properties, and the incremental increase in noise, as well as continued flare and inert munitions use, is not expected to impact historic properties under airspace.

Native American Concerns. Native American concerns are similar to those described for Scenario H1 above. Likewise, potential impacts on traditional cultural resources under the airspace, particularly on the Mescalero Apache Indian Reservation that underlies airspace associated with Holloman AFB, would be similar to those described under Scenario H1. As stated above, the Mescalero Apache Tribe indicated in an oral response that it had no comments on the Air Force proposal.

Scenario H1W. Under this scenario, 24 F-35A aircraft would be bedded down at Holloman AFB, and would train in the primary use airspace units described above and listed in Tables HO 2.2–1, HO 2.2–3, and HO 2.2–6.

Subsonic noise would increase somewhat under all of the airspace units except at the Beak MOAs and overlying ATCAAs, Cato MOA, R-5107 (Mesa L/H-WSMR), and R-5107 (Yonder) but would remain below 65 dB DNL_{mr}. The greatest subsonic noise increase would occur under the air-to-ground range restricted airspace at R-5107 (Oscura-WSMR). Subsonic noise under the centerlines of all of the MTRs associated with Holloman AFB would increase marginally to levels between 52 dB DNL_{mr} and 57 dB DNL_{mr}. Under Scenario H1W, the number of sonic booms per month would decrease by three booms per month, increase by six per month, or remain about the same (see Table HO 3.2–4).

As under Scenario H1, no impacts on historic properties under airspace associated with Holloman AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-16 and other legacy aircraft has not impacted historic properties, and the incremental increase in noise as well as continued flare and inert munitions use, is not expected to impact historic properties under airspace.

Native American Concerns. Native American concerns are similar to those described for Scenario H1 above. Likewise, potential impacts on traditional cultural resources under the airspace, particularly on the two Indian Reservations that underlie airspace associated with Holloman AFB, would be similar to those described under Scenario H1. As stated above, the Mescalero Apache Tribe indicated in an oral response that it had no comments on the Air Force proposal.

Scenario H2W. Under this scenario, 48 F-35A aircraft would be bedded down at Holloman AFB and would train in the primary use airspace units described above and listed in Tables HO 2.2–1, HO 2.2–3, and HO 2.2–6.

Subsonic noise would increase somewhat under all of the airspace units except the Cato MOA, but would remain at or below 65 dB DNL_{mr}. The greatest subsonic noise increase would occur under the air-to-ground range restricted airspace at R-5107 (Red Rio-WSMR), R-5107 (Oscura-WSMR), and R-5103 (Centennial Range-Fort Bliss). Subsonic noise under centerlines of all of the MTRs associated with Holloman AFB would increase marginally to levels between 53 and 59 dB DNL_{mr}. Under Scenario H2W, the number of sonic booms per month would increase by between three and nine per month or remain about the same (see Table HO 3.2–4).

As under Scenario H1, no impacts on historic properties under airspace associated with Holloman AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-16 and other legacy aircraft has not impacted historic properties, and the incremental increase in noise, as well as continued flare and inert munitions use, is not expected to impact historic properties under airspace.

Native American Concerns. Native American concerns are similar to those described for Scenario H1 above. Likewise, potential impacts on traditional cultural resources under the airspace, particularly on the Mescalero Apache Indian Reservation that underlies airspace associated with Holloman AFB, would be similar to those described under Scenario H1. As stated above, the Mescalero Apache Tribe indicated in an oral response that it had no comments on the Air Force proposal.

Scenario H3W. Under this scenario, 72 F-35A aircraft would be bedded down at Holloman AFB and would train in the primary use airspace units described above and listed in Tables HO 2.2–1, HO 2.2–3, and HO 2.2–6.

Subsonic noise would increase somewhat under all of the airspace units, but would remain at or below 66 dB DNL_{mr}. The greatest subsonic noise increase would occur under the air-to-ground range restricted airspace at R-5107 (Red Rio-WSMR), R-5107 (Oscura-WSMR), and R-5103 (Centennial Range-Fort Bliss). Subsonic noise under the centerlines of all of the MTRs associated with Holloman AFB would increase by 5 to 6 dB DNL_{mr} to levels between 54 and 60 dB DNL_{mr}. Under Scenario H3W, the number of sonic booms per month would increase by between 3 and 12 per month or remain about the same (see Table HO 3.2–4).

As under Scenario H1, no impacts on historic properties under airspace associated with Holloman AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-16 and other legacy aircraft has not impacted historic properties, and the incremental increase in noise, as well as continued flare and inert munitions use, is not expected to impact historic properties under airspace.

Native American Concerns. Native American concerns are similar to those described for Scenario H1 above. Likewise, potential impacts on traditional cultural resources under the airspace, particularly on the Mescalero Apache Indian Reservation that underlies airspace associated with Holloman AFB, would be similar to those described under Scenario H1. As stated above, the Mescalero Apache Tribe indicated in an oral response that it had no comments on the Air Force proposal.

HO 3.10 Land Use and Recreation

HO 3.10.1 Base

HO 3.10.1.1 Base Affected Environment

Land Use

Regulatory Setting. The following information addresses Federal, state, and local statutes, regulations, programs, and plans that are relevant to the analysis of land use for Holloman AFB and the surrounding areas. Because potential land use impacts are largely noise-related, the discussion of regulatory setting focuses on noise-related land use regulations and compatibility constraints.

Holloman AFB AICUZ. Air Installation Compatible Use Zone (AICUZ), Holloman AFB, New Mexico, identifies noise contours for noise levels that exceed 65 dB DNL, from operations at Holloman AFB (Holloman AFB 2004b). These noise contours extend over Holloman AFB, the southeastern portion of WSMR, the northeastern portion of WHSA, and portions of unincorporated Otero County. Privately held land in noise-impacted areas is designated for open/agricultural/low-density uses and is considered compatible. One exception is an area located along U.S. Route 70 known as Government Subdivision, a very small residential/commercial area now located inside the 65 dB DNL contour.

Holloman AFB General Plan. General Plan, Holloman AFB, was prepared in response to AFI 32-7062 (Air Force 1997b). The General Plan is a component of the Base Comprehensive Plan. The Holloman AFB General Plan guides overall organization and development of the base to support the mission on the installation. The General Plan defines 12 land use categories to achieve the most effective use of land and facilities. For the most part, existing land uses on the base have been developed within planning and safety criteria to be compatible with each other. These uses include safety and security restricted zones; contamination avoidance sites; and natural features, such as floodplains, wetlands, and sensitive habitats.

Local Regulations and Ordinances. The Otero County Comprehensive Plan does not specifically designate a land use category or overlay for Holloman AFB, although it is referred to as "Federal property" (Otero County 2005). The General Plan goal applicable to Holloman AFB is to ensure that the Holloman AFB mission is not jeopardized by incompatible growth.

Most of the Otero County land that lies between the eastern boundary of Holloman AFB and the Alamogordo city limits is located within the extraterritorial jurisdiction of the City of Alamogordo. Joint city and county review of land development activities within a 5-mile radius of the city limits is allowed by state statute. In addition, the City of Alamogordo is responsible for issuing all building and development permits within this area.

On-Base Land Use. Holloman AFB is located in Otero County, in southeastern New Mexico, approximately 6 miles west of the City of Alamogordo, although one narrow extension of the city reaches along U.S. Route 70 to 3 miles east of the base. Holloman AFB is bounded on the northwest by the Army-administered WSMR, which extends roughly 100 miles to the north and

south and 40 miles east and west. WHSA is located southwest of the base. The eastern boundary of Holloman AFB is bounded by private land and land administered by BLM (Holloman AFB 2008a).

Holloman AFB consists of two parcels of land totaling 59,743 acres. Within its contiguous boundaries (main base) are 52,411 acres, including a land parcel transfer of 1,262 acres from BLM near the Lake Holloman complex in the southwestern portion of the base. In addition, the BWWSA is a parcel of about 7,332 acres east of U.S. Route 54 (Holloman AFB 2008a).

The base is predominately undeveloped open space used for a variety of mission-related activities. Some open space serves as a buffer required for safety clearances, security areas, utility easements, and environmentally sensitive areas (Air Force 2009a). Holloman AFB has three main developed areas: Main Area, North Area, and West Area. The heaviest concentration of facilities is in the south end of the base and flanks the southern side of the airfield. The Main Base Area (cantonment) comprises approximately 8,000 acres within the southern portion of the base (Holloman AFB 2008a). Land uses within this area include a mixture of housing, outdoor recreation, community commercial, community services, administration, and medical land uses. North of the cantonment area is a scatter of industrial and aircraft operations and maintenance land uses (Holloman AFB 2008a).

The North and West Areas contain a mixture of industrial, airfield, aviation-related, administrative, and community uses. The North Area (i.e., area north of Runway 07/25) consists of open space or aircraft operations and maintenance land uses (Holloman AFB 2008a). Portions of the West Area have been developed as a separate cantonment area. Between the areas lie industrial and administrative land uses.

The Lake Holloman wetland complex public access area comprises approximately 1,800 acres in the southernmost portion of the base, directly south of the cantonment area. This area serves as the water containment for treated sewage effluent from the wastewater treatment plant. The area is designated as public use and is open to the public for recreational activities on a limited basis within established regulations.

The base also has jurisdiction over approximately 7,000 acres of the BWWSA on the Boles, Douglas, and San Andres well fields. The primary purpose of the BWWSA and the Bonito Lake Water System is to provide continuous sources of potable water for the base (Holloman AFB 2008a).

Holloman AFB also has use, through a Memorandum of Understanding, of five areas located on WSMR for military training purposes. These areas are geographically separated units, including Red Rio Bombing Range, Oscura Bombing Range, National Radar Test Facility, RATSCAT Advanced Measurement Site, and the Air Force Special Weapons Complex (Holloman AFB 2008a).

Surrounding Land Use. Lands to the south and northeast of Holloman AFB are administered by BLM and are primarily leased for agriculture/open land use (i.e., grazing). WHSA encompasses an area of approximately 145,000 acres to the southwest of Holloman AFB designated as recreational land use. The National Park Service administers WHSA, which is used for recreation and preservation of special resource values (e.g., flora and fauna, geologic,

visual). WSMR surrounds WHSA and borders Holloman AFB to the north, west, and south. This area, designated as public/quasi-public land use, is essentially undeveloped and supports a variety of military and test and development activities at specific locations and in airspace over the range (Holloman AFB 2006).

A combination of BLM, state-owned, and private lands within Otero County are located to the east, southeast, and southwest of the base. These lands are designated for open/agricultural/transportation land use and are used primarily for grazing. Scattered commercial and light industrial development is found along U.S. Route 70 between Holloman AFB and the city of Alamogordo. On the south side of U.S. Route 70, a mix of residential, commercial, and light industrial uses occur closer to the city of Alamogordo.

Land uses within the existing 65 dB DNL or greater noise contours for Holloman AFB primarily consist of open, public/quasi-public, recreational, and residential areas (see Table HO 3.10–1).

Table HO 3.10–1. Off-Base Land Uses within the Holloman AFB 65 dB DNL and Greater Noise Contours, Baseline Contours

Contour Interval (dB DNL)	***Land Use (acres)***						
	Commercial	**Industrial**	**Open**	**Public/ Quasi-Public**	**Recreational**	**Residential**	**Total Area Affected**
65–69	0	0	2,221	1,515	1,728	32	5,496
70–74	0	0	863	623	46	0	1,532
75–79	0	0	192	47	0	0	240
80–84	0	0	39	1	0	0	40
≥ 85	0	0	0	0	0	0	0
Total	**0**	**0**	**3,315**	**2,186**	**1,774**	**32**	**7,308**

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acres are displayed as whole numbers in the text and tables, whereas calculations are based on raw [GIS] acreage numbers containing decimal points.
Source: APZD 2010; BLM 2010.

Recreation

Holloman AFB has several outdoor recreational areas for use by base personnel, including a golf course, soccer fields, ball fields, tennis, football, track, jogging paths, two parks, family camping area, skeet/archery range, and an equestrian facility. Most facilities are located in areas affected by baseline noise levels of 75 dB DNL or less and are thus compatible with noise. Portions of the golf course are within the CZ and experience high noise levels, above 85 dB DNL (Holloman AFB 2009a).

Adjacent to the base to the southwest, WHSA, administered by the National Park Service, is a popular destination for in-state and out-of-state visitors. The monument is a natural wonder of gypsum sand dunes spread over 275 square miles. Park facilities include a visitor center with educational displays and a gift shop, an access road, trails, boardwalks, and picnic areas. Favorite activities include sledding and sliding in the dunes, photography, scenic viewing, full moon hikes, and monthly tours to Lake Lucero. Permitted camping is also allowed. Portions of the monument are governed by a co-use agreement with WSMR. This agreement allows WSMR to use the co-use area as a surface danger zone for hazardous activities. Public access is therefore restricted in these areas. The main public areas in the northeastern part of the monument are close to Holloman AFB and experience noise from airfield operations. Over the

years, flight tracks for the primary runways have been modified to minimize direct overflight of monument facilities to reduce noise.

HO 3.10.1.2 Base Environmental Consequences

Land Use

Figures HO 3.10–1 through HO 3.10–8 display projected noise contours compared with baseline noise overlaid on existing land use for Holloman AFB Scenarios H1W through H3W and H1 through H5. The land use resource area definition and methodology for analysis is described in Chapter 3, Section 3.8.

Scenario H1W. The F-35A training beddown would require construction and modification of facilities within Holloman AFB on the west side of the base immediately south of the existing F-16 campus (see Table HO 2.1–2 and Figure HO 2.2–1). No additional construction is projected in any location outside the installation. The land uses on the installation are characteristic of a military airfield. New facilities would be designed and sited to be consistent with the general plan, airfield safety guidelines, and related planning programs to ensure that projected development associated with F-35A training would be compatible with surrounding land uses. Land use impacts on surrounding communities during construction are expected to be minimal because proposed development would be contained within existing military designations at Holloman AFB. In addition, traffic, noise, dust, and similar effects from construction equipment and vehicles would be reduced through construction plans and practices agreed to by contractors.

A discussion of projected on-base noise levels under Scenario H1W is presented in Section HO 3.2. As summarized in Table HO 3.10–2, activities under Scenario H1W would increase the area surrounding Holloman AFB within the 65 dB DNL or greater noise contour by approximately 1,998 acres compared with baseline conditions. The number of off-installation residents affected by noise levels greater than 65 dB DNL would remain essentially the same, decreasing by one, with most increases affecting non-residential land use types. Lands characterized as industrial and commercial would not be affected by noise levels greater than 65 dB DNL under baseline conditions or under Scenario H1W. The area of recreational land use affected by noise levels greater than 65 dB DNL would increase by 1,239 acres. The next largest increase in acreage would be public/quasi-public areas (685 acres), followed by open lands (an increase of 69 acres) and residential lands (an increase of 4 acres).

Comparing the baseline noise contours with those projected under Scenario H1W, there would be areas of shifted exposure surrounding Holloman AFB (i.e., land currently within the existing noise contours that would no longer be affected and areas outside the baseline noise contours that would be newly affected) (see Figure HO 3.10–1). Off-base areas that would be newly located under the 65 dB or greater contours are to the southwest and west of the installation in areas within and adjacent to WHSA that are designated as public/quasi-public and recreational land uses.

Scenario H2W. Construction activities under Scenario H2W would be similar in nature to those under Scenario H1W, but the total acreage affected by construction activities would be slightly greater. A discussion of projected on-base noise levels under Scenario H2W is presented in Section HO 3.2.

Activities under Scenario H2W would increase the area surrounding Holloman AFB within the 65 dB DNL or greater noise contour by approximately 3,572 acres compared with baseline conditions. The number of off-installation residents affected by noise levels greater than 65 dB DNL would remain essentially the same as baseline conditions because mostly non-residential land uses would be affected. Overall, acreage of open, public/quasi-public, recreational, and residential land uses under the 65 dB DNL or greater noise contours would increase, while commercial and industrial land uses would not change. The largest increase in acreage would be recreational land use (an increase of 2,220 acres), followed by public/ quasi-public land use (an increase of 1,144 acres), open land use (an increase of 198 acres), and residential lands (an increase of 9 acres). Locations of off-base areas newly affected by noise levels under the 65 dB DNL or greater noise contours are similar to those under Scenario H1W.

Scenario H3W. Construction activities under Scenario H3W would be similar in nature to those under Scenario H1W, but the total acreage affected by construction activities would be slightly greater.

A discussion of projected on-base noise levels under Scenario H3W is presented in Section HO 3.2. Activities under Scenario H3W would increase the area surrounding Holloman AFB within the 65 dB DNL or greater noise contour by approximately 4,975 acres compared with baseline conditions (see Table HO 3.10–2). The number of off-installation residents affected by noise levels greater than 65 dB DNL would remain essentially the same as baseline conditions because mostly non-residential land uses would be affected. Overall, acreage of open, public/quasi-public, recreational, and residential land uses under the 65 dB DNL or greater noise contours would increase, while commercial and industrial land uses would not change. The largest increase in acreage would be recreational land use (an increase of 2,942 acres), followed by public/quasi-public land use (an increase of 1,655 acres), open land use (an increase of 362 acres), and residential lands (an increase of 16 acres). Locations of off-base areas newly affected by noise levels under the 65 dB DNL or greater noise contours are similar to those under Scenarios H1W and H2W.

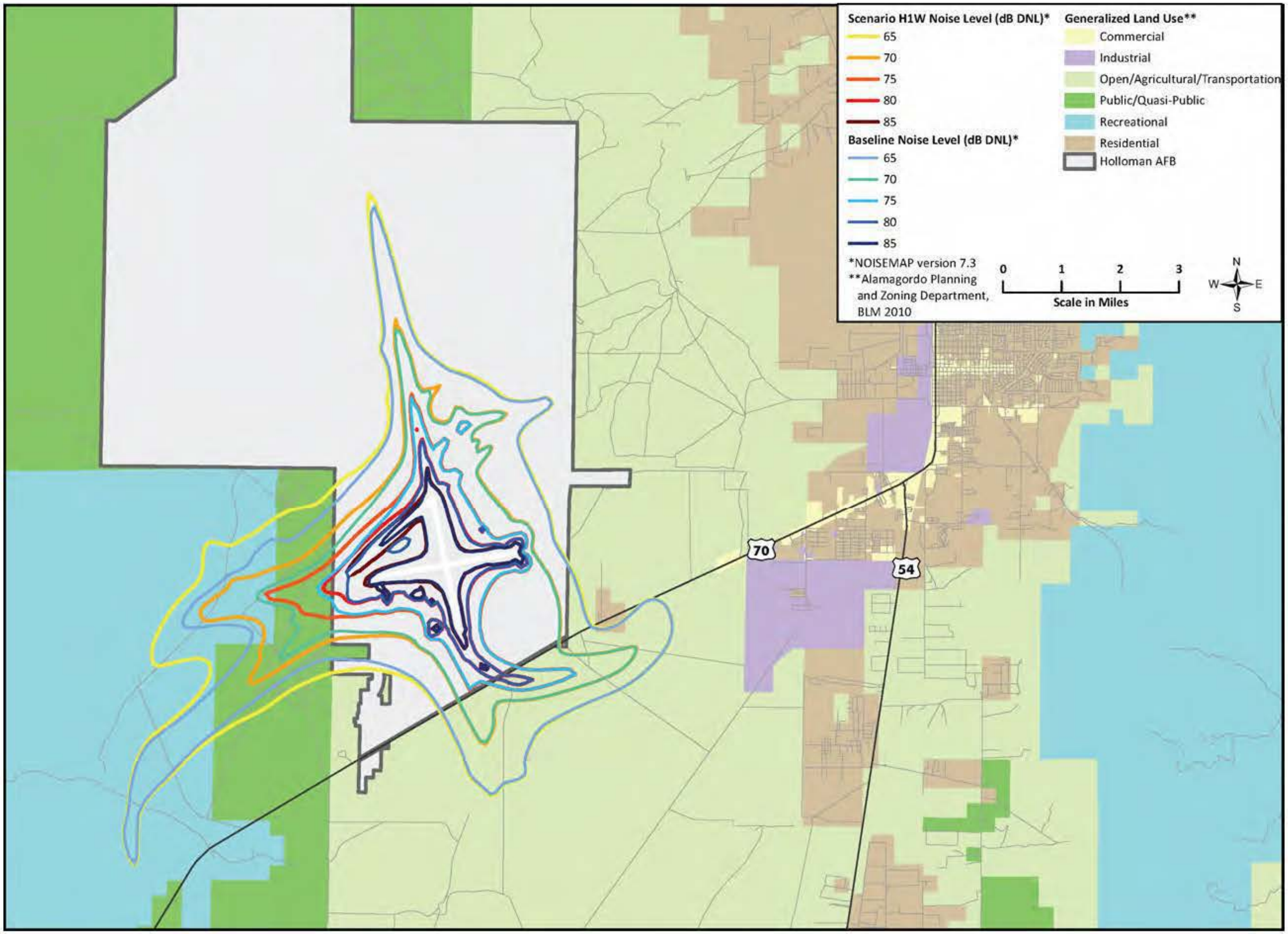


Figure HO 3.10–1. Scenario H1W and Baseline Land Use and Noise Contours in Areas Surrounding Holloman AFB

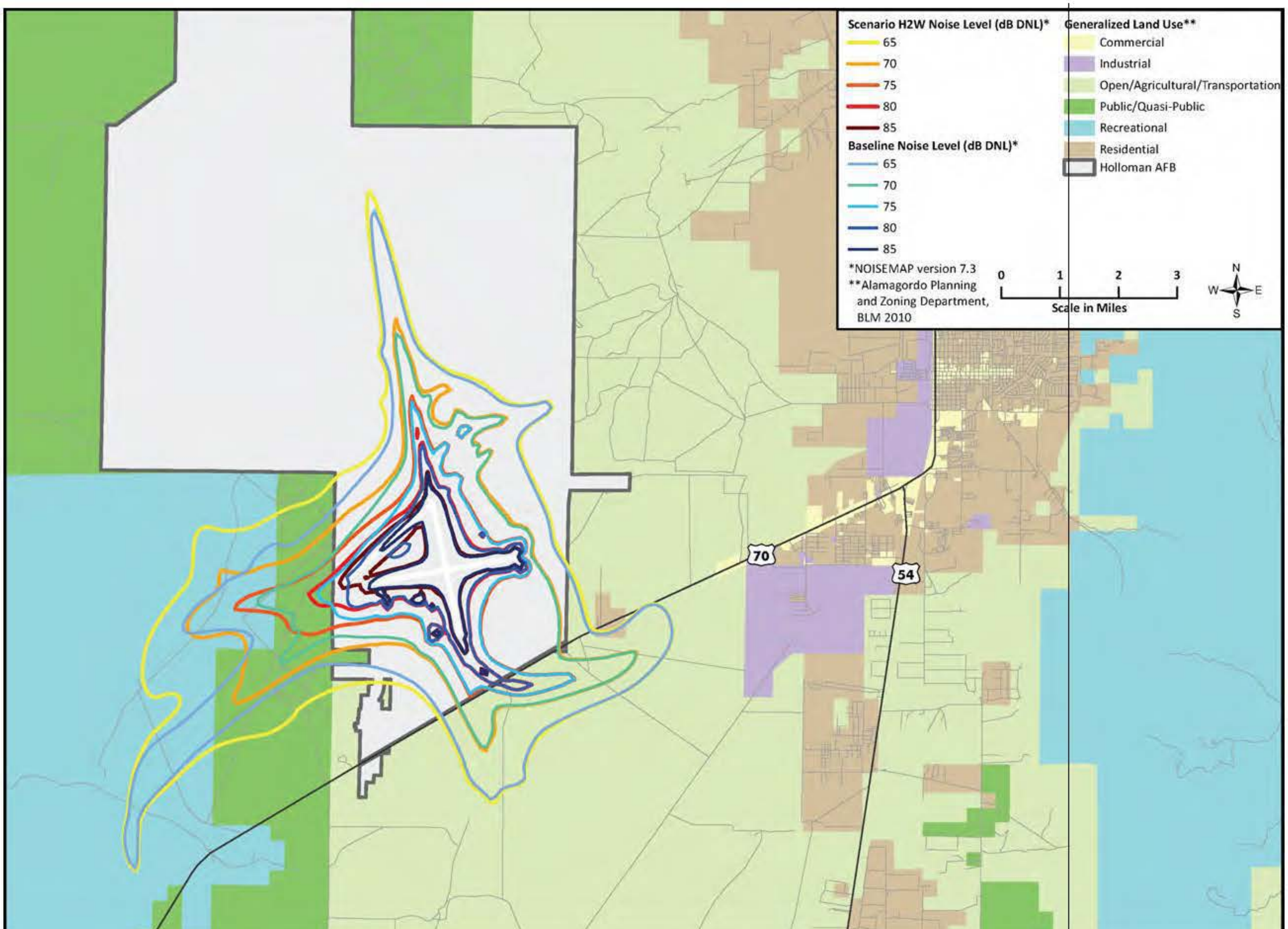


Figure HO 3.10–2. Scenario H2W and Baseline Land Use and Noise Contours in Areas Surrounding Holloman AFB

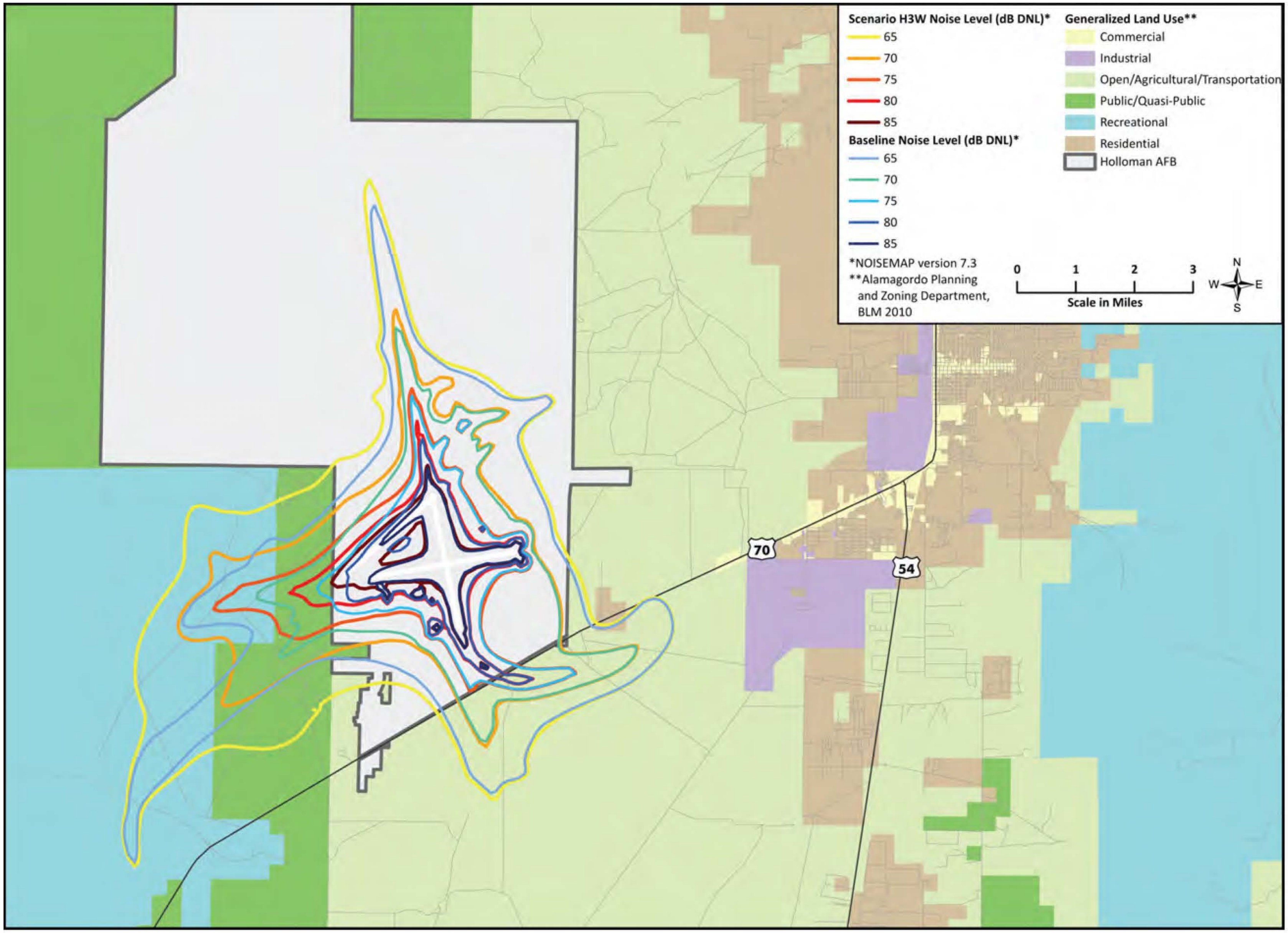


Figure HO 3.10–3. Scenario H3W and Baseline Land Use and Noise Contours in Areas Surrounding Holloman AFB

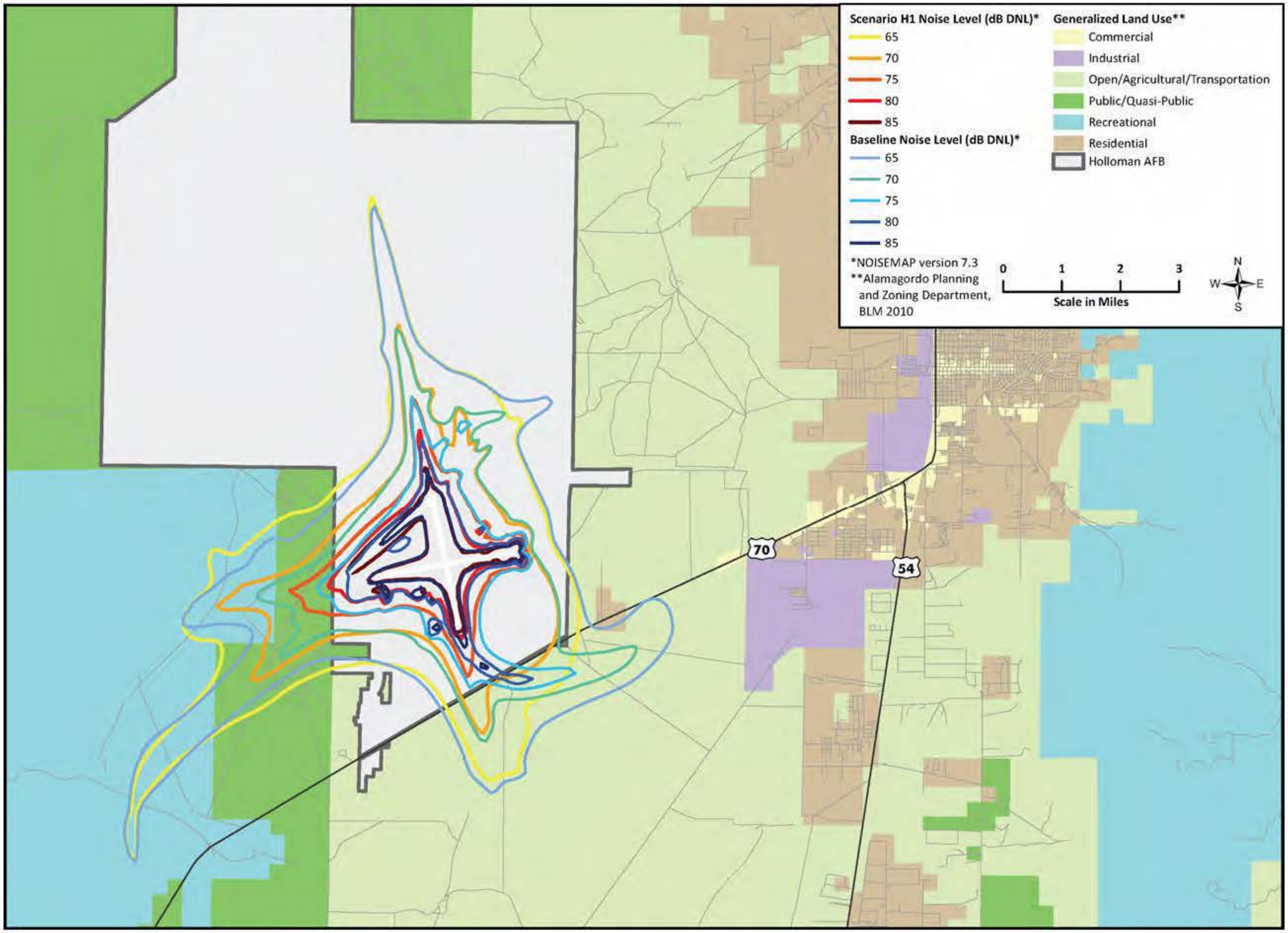


Figure HO 3.10–4. Scenario H1 and Baseline Land Use and Noise Contours in Areas Surrounding Holloman AFB

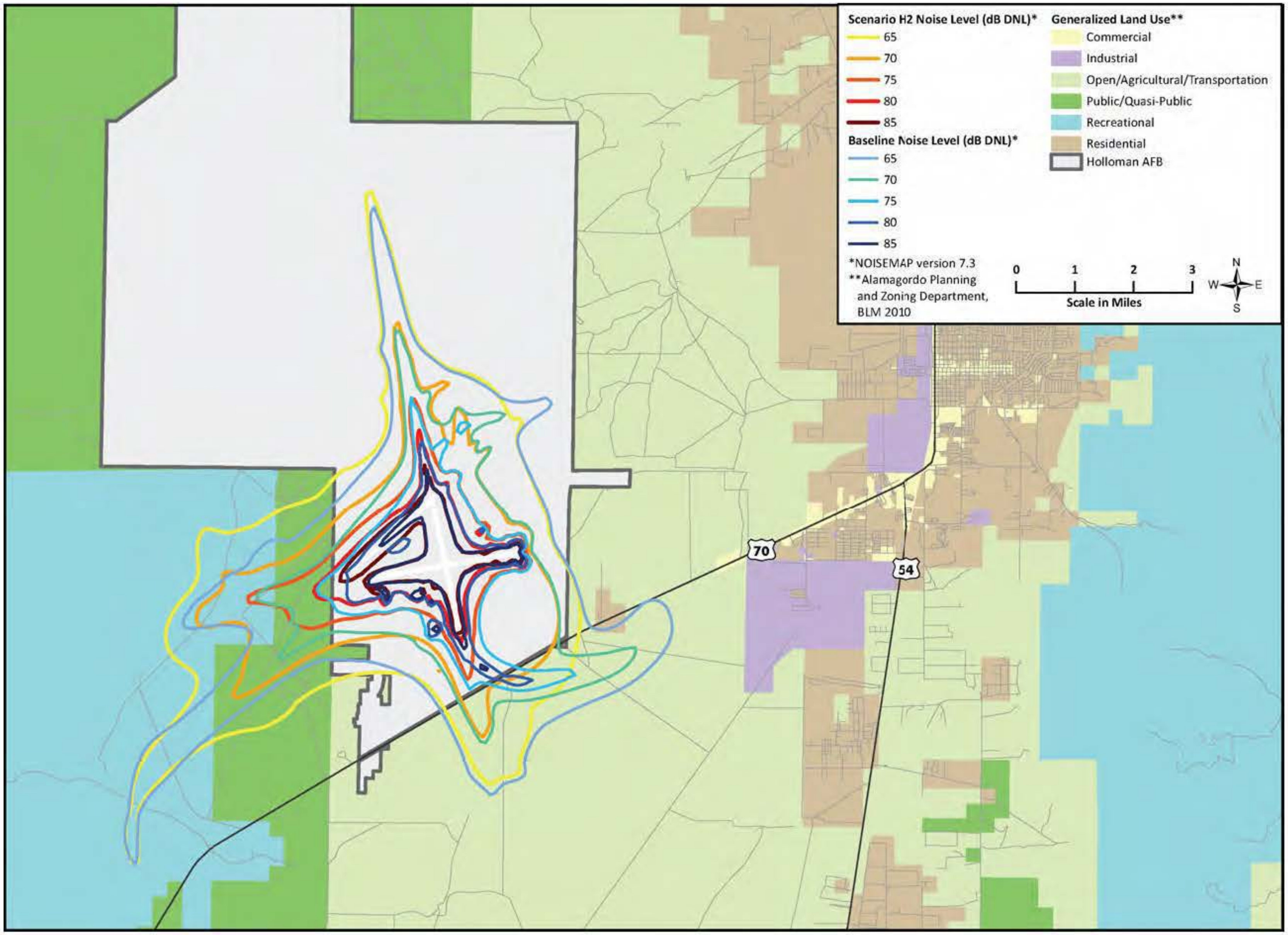


Figure HO 3.10–5. Scenario H2 and Baseline Land Use and Noise Contours in Areas Surrounding Holloman AFB

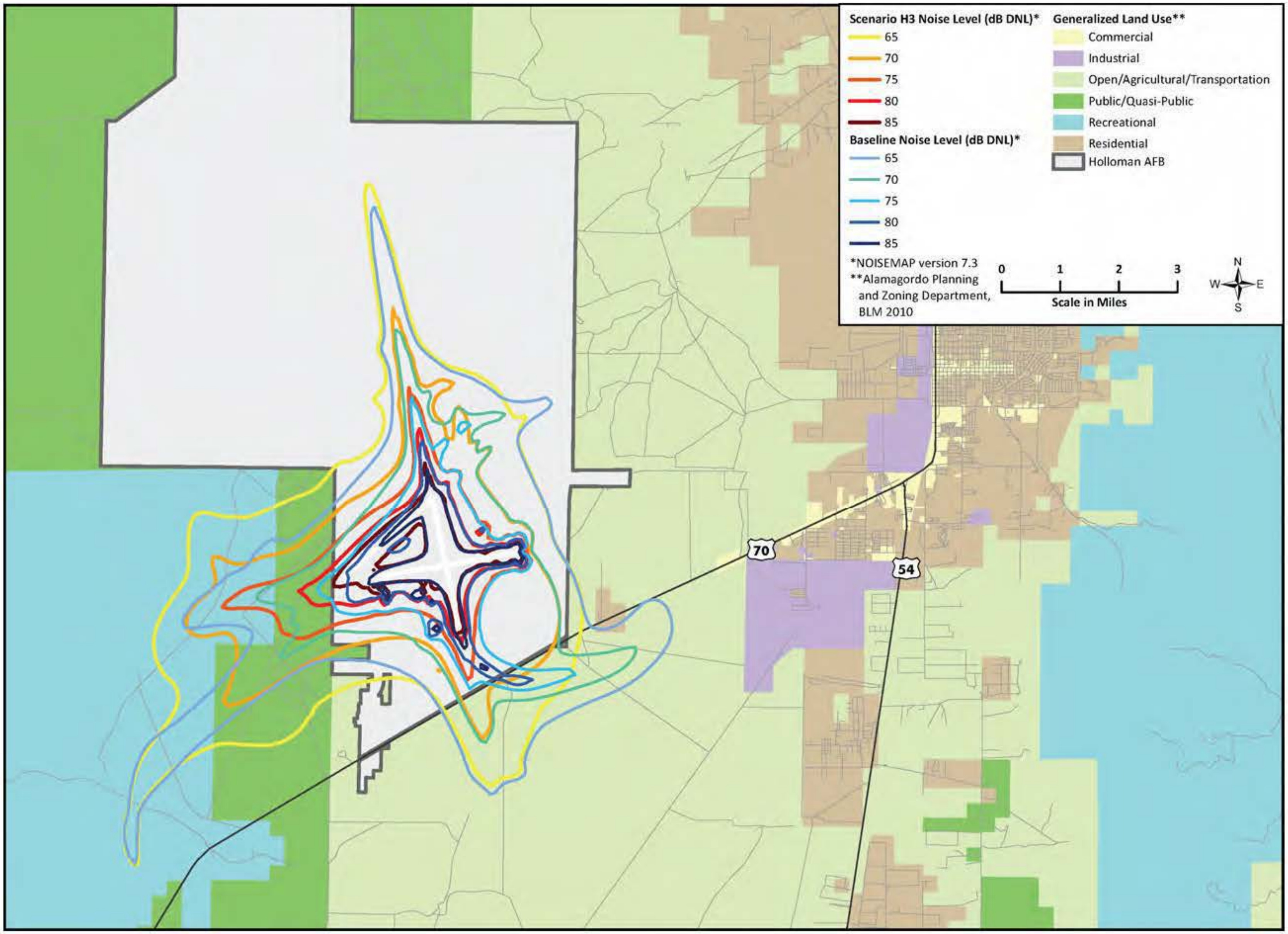


Figure HO 3.10–6. Scenario H3 and Baseline Land Use and Noise Contours in Areas Surrounding Holloman AFB

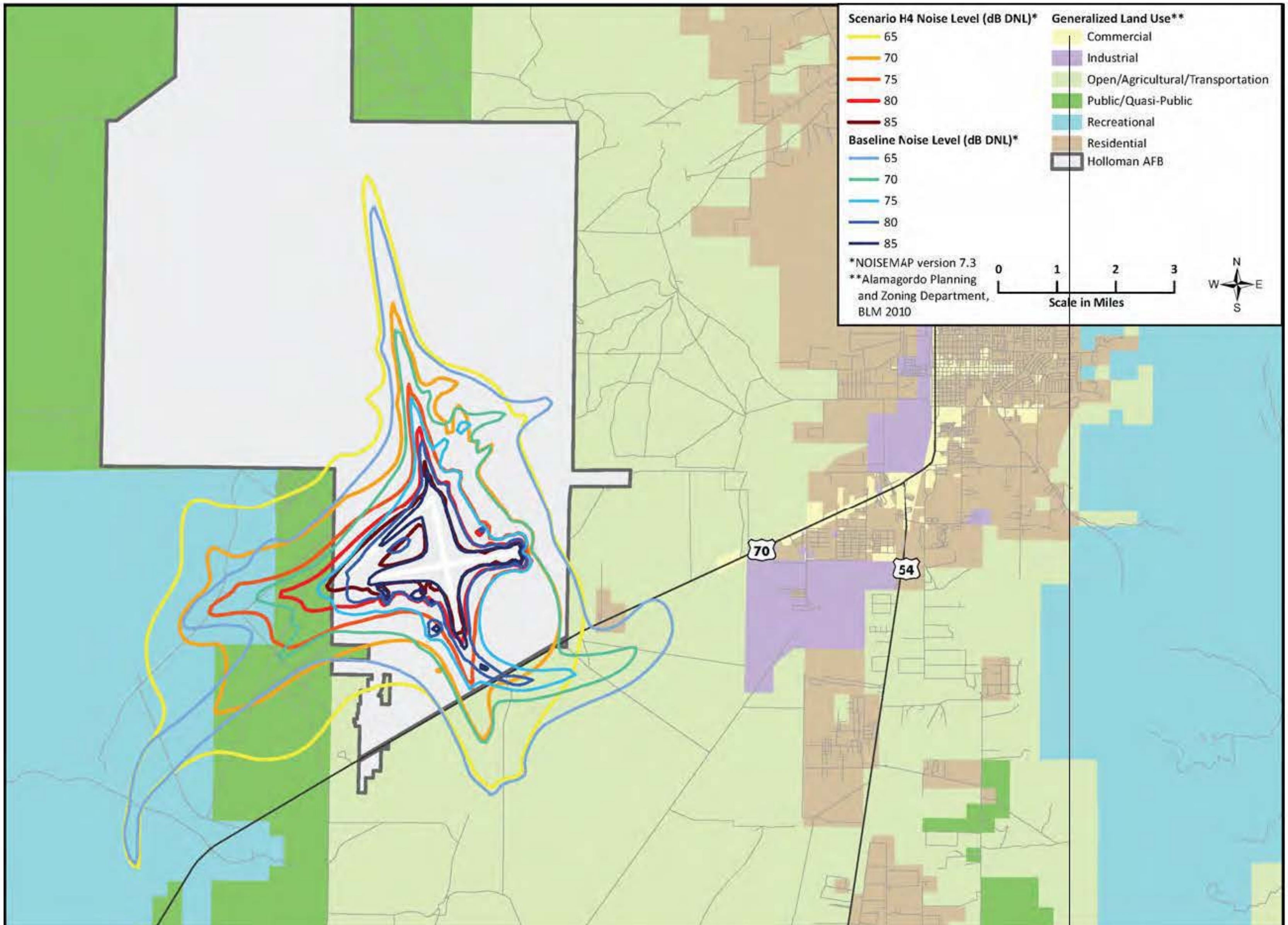


Figure HO 3.10–7. Scenario H4 and Baseline Land Use and Noise Contours in Areas Surrounding Holloman AFB

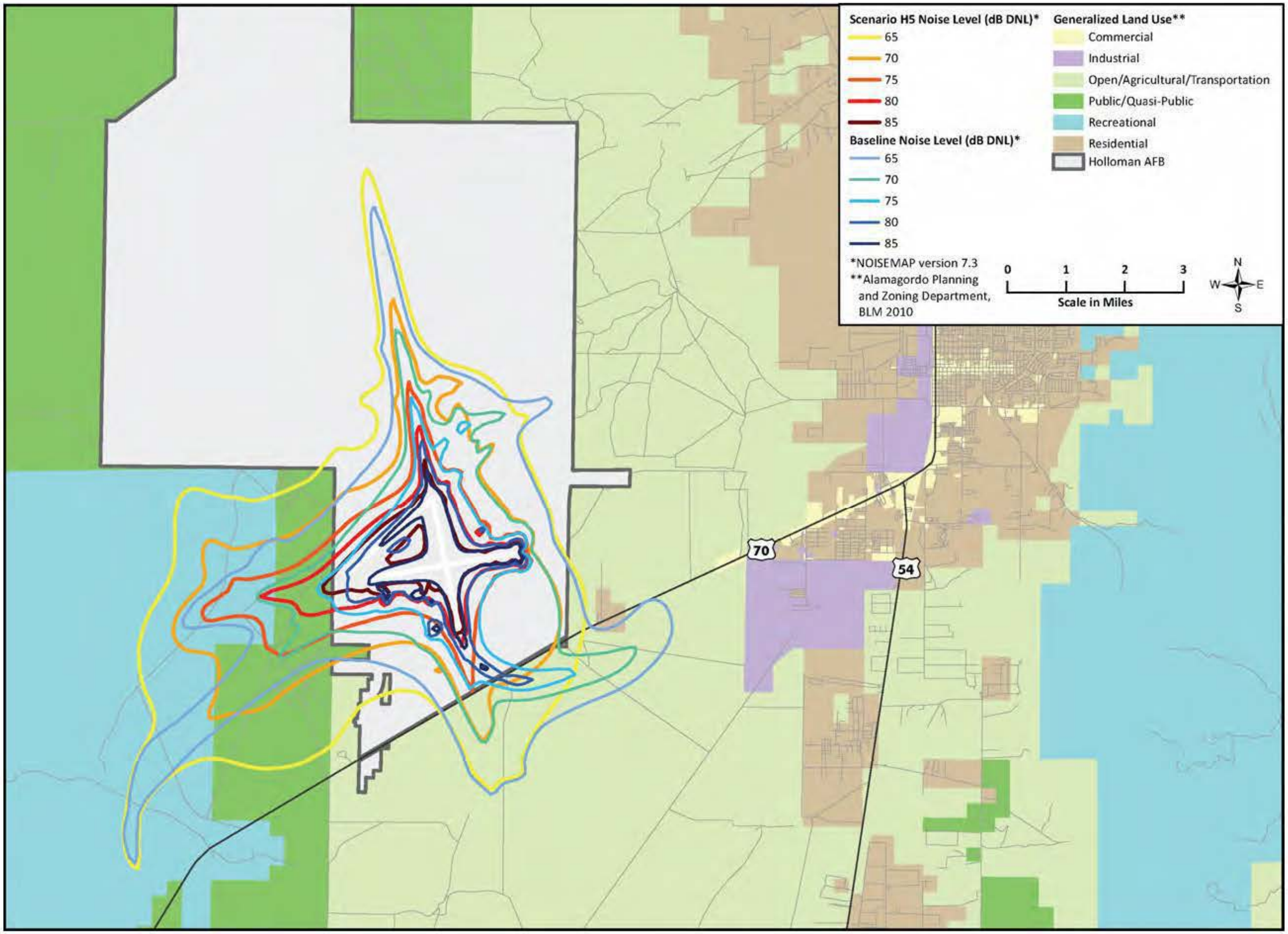


Figure HO 3.10–8. Scenario H5 and Baseline Land Use and Noise Contours in Areas Surrounding Holloman AFB

Table HO 3.10–2. Off-Base Land Uses within the Holloman AFB 65 dB DNL and Greater Noise Contours, F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Generalized Land Use (Off-Installation/Airport)*													
	Commercial		**Industrial**		**Open**		**Public/Quasi-Public**		**Recreational**		**Residential**		**Total Area Affected**	
	Acres	**Change**	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**
Scenario H1W (24 Aircraft)														
65–69	0	0	0	0	2,269	49	1,673	158	2,472	743	37	4	6,450	954
70–74	0	0	0	0	881	18	849	226	531	485	0	0	2,261	729
75–79	0	0	0	0	194	2	330	282	11	11	0	0	534	295
80–84	0	0	0	0	39	0	20	19	0	0	0	0	59	20
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**0**	**0**	**0**	**0**	**3,383**	**69**	**2,871**	**685**	**3,014**	**1,239**	**37**	**4**	**9,305**	**1,998**
Scenario H2W (48 Aircraft)														
65–69	0	0	0	0	2,377	156	1,780	265	3,041	1,313	42	9	7,240	1,744
70–74	0	0	0	0	901	38	977	354	831	785	0	0	2,709	1,176
75–79	0	0	0	0	196	4	487	440	122	122	0	0	805	565
80–84	0	0	0	0	39	1	86	86	0	0	0	0	126	87
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**0**	**0**	**0**	**0**	**3,513**	**198**	**3,330**	**1,144**	**3,994**	**2,220**	**42**	**9**	**10,879**	**3,572**
Scenario H3W (72 Aircraft)														
65–69	0	0	0	0	2,519	299	1,951	436	3,435	1,707	48	16	7,953	2,457
70–74	0	0	0	0	920	57	1,148	525	1,023	977	0	0	3,091	1,559
75–79	0	0	0	0	198	5	571	524	259	259	0	0	1,028	788
80–84	0	0	0	0	40	1	171	170	0	0	0	0	211	171
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**0**	**0**	**0**	**0**	**3,677**	**362**	**3,841**	**1,655**	**4,717**	**2,942**	**48**	**16**	**12,283**	**4,975**
Scenario H1 (24 Aircraft)														
65–69	0	0	0	0	1,366	(855)	1,639	124	1,825	97	0	(32)	4,830	(666)
70–74	0	0	0	0	247	(616)	877	254	288	242	0	0	1,412	(120)
75–79	0	0	0	0	0	(192)	225	178	0	0	0	0	225	(15)
80–84	0	0	0	0	0	(39)	6	5	0	0	0	0	6	(33)
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**0**	**0**	**0**	**0**	**1,613**	**(1,702)**	**2,747**	**561**	**2,113**	**339**	**0**	**(32)**	**6,473**	**(834)**

Contour Interval (dB DNL)	Generalized Land Use (Off-Installation/Airport)													
	Commercial		Industrial		Open		Public/Quasi-Public		Recreational		Residential		Total Area Affected	
	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change
Scenario H2 (48 Aircraft)														
65–69	0	0	0	0	1,463	(758)	1,754	239	2,314	586	0	(32)	5,531	35
70–74	0	0	0	0	270	(593)	966	343	683	637	0	0	1,919	387
75–79	0	0	0	0	0	(192)	449	402	63	63	0	0	512	272
80–84	0	0	0	0	0	(39)	62	61	0	0	0	0	62	23
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**0**	**0**	**0**	**0**	**1,733**	**(1,582)**	**3,231**	**1,045**	**3,060**	**1,286**	**0**	**(32)**	**8,024**	**717**
Scenario H3 (72 Aircraft)														
65–69	0	0	0	0	1,629	(592)	1,897	382	2,704	976	0	(32)	6,230	734
70–74	0	0	0	0	294	(569)	1,117	494	914	868	0	0	2,325	793
75–79	0	0	0	0	0	(192)	560	513	187	187	0	0	747	507
80–84	0	0	0	0	0	(39)	138	137	0	0	0	0	138	99
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**0**	**0**	**0**	**0**	**1,923**	**(1,392)**	**3,712**	**1,526**	**3,805**	**2,031**	**0**	**(32)**	**9,440**	**2,133**
Scenario H4 (96 Aircraft)														
65–69	0	0	0	0	1,812	(409)	1,990	475	3,067	1,339	0	(32)	6,869	1,373
70–74	0	0	0	0	317	(546)	1,318	695	1,044	998	0	0	2,679	1,147
75–79	0	0	0	0	0	(192)	602	555	337	337	0	0	939	699
80–84	0	0	0	0	0	(39)	228	227	0	0	0	0	228	189
≥ 85	0	0	0	0	0	0	7	7	0	0	0	0	7	7
Total ≥ 65	**0**	**0**	**0**	**0**	**2,129**	**(1,186)**	**4,145**	**1,959**	**4,448**	**2,674**	**0**	**(32)**	**10,722**	**3,415**
Scenario H5 (120 Aircraft)														
65–69	0	0	0	0	2,028	(193)	1,992	477	3,375	1,647	0	(32)	7,395	1,899
70–74	0	0	0	0	341	(522)	1,519	896	1,141	1,095	0	0	3,001	1,469
75–79	0	0	0	0	0	(192)	621	574	477	477	0	0	1,098	858
80–84	0	0	0	0	0	(39)	303	302	14	14	0	0	317	278
≥ 85	0	0	0	0	0	0	22	22	0	0	0	0	22	22
Total ≥ 65	**0**	**0**	**0**	**0**	**2,369**	**(946)**	**4,457**	**2,271**	**5,007**	**3,233**	**0**	**(32)**	**11,833**	**4,526**

Note: (Number) denotes a negative number.
Source: APZD 2010; BLM 2010.

Scenario H1. Activities under Scenario H1 would be similar in nature to those under Scenario H1W, but would affect fewer acres. A discussion of projected on-base noise levels under Scenario H1 is presented in Section HO 3.2.

Activities under Scenario H1 would decrease the area surrounding Holloman AFB within the 65 dB DNL or greater noise contour by approximately 834 acres compared with baseline conditions (see Table HO 3.10–2). This would result in a decrease in the number of people affected by the 65 dB DNL or greater noise contours by approximately five individuals. Overall, acreage of open and residential land uses under the 65 dB DNL or greater noise contours would decrease, while commercial and industrial land uses would not change and public/quasi-public and recreational land uses would increase.

Comparing the baseline noise contours with those projected under Scenario H1, there would be areas of shifted exposure surrounding Holloman AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected. Off-base areas that would be newly located under the 65 dB DNL or greater noise contours are to the west of the airstrip in areas within and adjacent to WHSA designated as public/quasi-public and recreational land uses. Areas to the southeast of Holloman AFB designated as open/agricultural/transportation land uses that are currently located within the 65 dB DNL or greater noise contours would no longer be exposed to these noise contours. A small area of residential land uses to the east would no longer be located under the 65 dB DNL or greater noise contours.

Scenario H2. Construction activities under Scenario H2 would be similar in nature to those under Scenario H1W, but would affect fewer acres. A discussion of projected on-base noise levels under Scenario H2 is presented in Section HO 3.2.

Activities under Scenario H2 would increase the area surrounding Holloman AFB within the 65 dB DNL or greater noise contour by approximately 717 acres compared with baseline conditions (see Table HO 3.10–2). This would result in a decrease in the number of people affected by the 65 dB DNL or greater noise contours by approximately five individuals. Overall, acreage of open and residential land uses under the 65 dB DNL or greater noise contours would decrease, while commercial and industrial land uses would not change and public/quasi-public and recreational land uses would increase.

Comparing the baseline noise contours with those projected under Scenario H2, there would be areas of shifted exposure surrounding Holloman AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). Off-base areas newly located or no longer located under the 65 dB DNL or greater noise contours would be similar to those under Scenario H1.

Scenario H3. Construction activities under Scenario H3 would be similar in nature to those under Scenario H1W, but would affect fewer acres. A discussion of projected on-base noise levels under Scenario H3 is presented in Section HO 3.2.

Activities under Scenario H3 would increase the area surrounding Holloman AFB within the 65 dB DNL or greater noise contour by approximately 2,131 acres compared with baseline conditions (see Table HO 3.10–2). This would result in a decrease in the number of people

affected by the 65 dB DNL or greater noise contours by approximately five individuals. Overall, acreage of open and residential land uses under the 65 dB DNL or greater noise contours would decrease, while commercial and industrial land uses would not change and public/quasi-public and recreational land uses would increase.

Comparing the baseline noise contours with those projected under Scenario H3, there would be areas of shifted exposure surrounding Holloman AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). Off-base areas newly located or no longer located under the 65 dB DNL or greater noise contours would be similar to those under Scenario H1.

Scenario H4. Construction activities under Scenario H4 would be similar in nature to those under Scenario H1W, but would affect fewer acres. A discussion of projected on-base noise levels under Scenario H4 is presented in Section HO 3.2.

Activities under Scenario H4 would increase the area surrounding Holloman AFB within the 65 dB DNL or greater noise contour by approximately 3,414 acres compared with baseline conditions (see Table HO 3.10–2). This would result in a decrease in the number of people affected by the 65 dB DNL or greater noise contours by approximately five individuals. Overall, acreage of open and residential land uses under the 65 dB DNL or greater noise contours would decrease, while commercial and industrial land uses would not change and public/quasi-public and recreational land uses would increase.

Comparing the baseline noise contours with those projected under Scenario H4, there would be areas of shifted exposure surrounding Holloman AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). Off-base areas newly located or no longer located under the 65 dB DNL or greater noise contours would be similar to those under Scenario H1.

Scenario H5. Construction activities under Scenario H5 would be similar in nature to those under Scenario H1W, but would affect fewer acres. A discussion of projected on-base noise levels under Scenario H5 is presented in Section HO 3.2.

Activities under Scenario H5 would increase the area surrounding Holloman AFB within the 65 dB DNL or greater noise contour by approximately 4,526 acres compared with baseline conditions (see Table HO 3.10–2). This would result in a decrease in the number of people affected by the 65 dB DNL or greater noise contours by approximately five individuals. Overall, acreage of open and residential land uses under the 65 dB DNL or greater noise contours would decrease, while commercial and industrial land uses would not change and public/quasi-public and recreational land uses would increase.

Comparing the baseline noise contours with those projected under Scenario H5, there would be areas of shifted exposure surrounding Holloman AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). Off-base areas newly located or no longer located under the 65 dB DNL or greater noise contours would be similar to those under Scenario H1.

Recreation

Most construction for the F-35A beddown under all scenarios would take place on the west side of the airfield away from more densely developed parts of Holloman AFB, and several miles from popular sites on WHSA. Typical concerns of noise, blowing dust, and traffic during construction would have little potential to directly affect surrounding recreational amenities because they are not located close to construction zones. Additional family housing would reuse sites in and around the existing family housing areas on Holloman AFB, replacing existing outdated housing. New housing would not displace recreational facilities and is compatible with nearby recreational amenities such as the golf course.

Personnel changes range from a net loss of 341 under Scenario H1 to a maximum increase of 1,820 under Scenario H5. Total base population (currently 12,873) could decrease by an estimated 1,157 under Scenario H1 and could increase by up to 5,494, for a total of 18,367 persons under Scenario H5. Holloman AFB provides indoor and outdoor facilities for personnel and family members. Historically, the base has supported higher population levels than current levels, and has adequate recreational facilities to meet the basic needs of the new population. Some personnel and family members may live in Alamogordo and use local facilities. Many public and commercial recreational facilities in Alamogordo are currently functioning below capacity, and could meet increased demand.

Tables HO 3.10–3 and HO 3.10–4 show that the primary access road, Dunes Drive, on WHSA and a portion of the WHSA land on the east side, away from the primary publicly accessible area of dunes and playas currently experience noise levels between 65 and 70 dB DNL. The main visitor center, picnic area, and trails within the monument experience levels below 65 dB DNL. Under all F-35A aircraft scenarios, there would be little appreciable change to noise exposure at the representative locations. The F-35A would use the same flight tracks as other aircraft using the airfield. These tracks have been modified over time to reduce noise exposure to the most visited parts of the monument. Changes in noise over the popular public trails, visitor center, and interpretive sites would be minimal. Individual visitors may find overflights out of Holloman AFB disturbing, but this is part of the current context.

Table HO 3.10–3. Noise Effects on Recreational Amenities Around Holloman AFB Under Scenarios H1W, H2W, and H3W

Recreational Amenity	*Average Noise Level (DNL)*			
	Baseline Conditions	**Scenario H1W (24 Aircraft)**	**Scenario H2W (48 Aircraft)**	**Scenario H3W (72 Aircraft)**
WHSA Visitor Center	< 65	< 65	< 65	< 65
WHSA Camp/Picnic Area	< 65	< 65	< 65	< 65
WHSA Big Dune Trail/Playa Trail	< 65	< 65	< 65	< 65
WHSA Dunes Drive	65–70[1]	65–70[1]	65–70[1]	65–70[1]

[1] Small stretch of road affected by about 65 dB DNL about 1.5 miles from park entry.
Source: NPS 2010a.

Table HO 3.10–4. Noise Effects on Recreational Amenities Around Holloman AFB Under Scenarios H1, H2, H3, H4, and H5

Recreational Amenity	*Average Noise Level (DNL)*					
	Baseline Conditions	**Scenario H1 (24 Aircraft)**	**Scenario H2 (48 Aircraft)**	**Scenario H3 (72 Aircraft)**	**Scenario H4 (96 Aircraft)**	**Scenario H5 (120 Aircraft)**
WHSA Visitor Center	< 65	< 65	< 65	< 65	< 65	< 65
WHSA Camp/Picnic Area	< 65	< 65	< 65	< 65	< 65	< 65
WHSA Big Dune Trail/Playa Trail	< 65	< 65	< 65	< 65	< 65	< 65
WHSA Dunes Drive	65–70[1]	65–70[1]	65–70[1]	65–70[1]	65–70[1]	65–70[1]

[1] Small stretch of road affected by about 65 dB DNL about 1.5 miles from park entry.
Source: NPS 2010a.

Figures HO 3.10–1, HO 3.10–2, and HO 3.10–3 illustrate that for F-35A Scenarios H1W, H2W, and H3W, there would be continued overflight of areas to the east of the base. This land is a mixture of private and public land. While there may be some use of this land for incidental hunting and sport activities, the area does not have any importance as a recreational resource for the region. Under F-35A Scenarios H1, H2, H3, H4, and H5, this would have reduced noise exposure.

HO 3.10.2 Airspace

HO 3.10.2.1 Airspace Affected Environment

Land Use

This section summarizes land ownership and Special Use Land Management Areas (SULMAs) underlying the airspace units associated with Holloman AFB. SULMAs include selected areas managed by Federal and state agencies that provide recreational and scenic opportunities (e.g., parks, monuments, and scenic river corridors), solitude or a wilderness experience (e.g., forests and wilderness areas), conservation of natural or cultural resources (e.g., wildlife refuge areas and national monuments), and other special management functions (e.g., Native American reservation lands). SULMAs often provide a combination of the attributes listed above. Some SULMAs may include recreation-oriented sites such as campgrounds, trails, and visitor centers; recreation is addressed separately below.

A description of the primary use airspace units overlying the SULMAs can be found in Section HO 3.1. Most of the primary use airspace overlies New Mexico, with additional portions in Texas (see Figure HO 3.10–9). The majority of Federal land under the airspace is administered by BLM, followed by DoD, the U.S. Forest Service, and the National Park Service. Training ranges include DoD and non-DoD lands, some requiring special management for conservation or recreation; typically, the non-DoD lands are managed by Federal civilian agencies.

Figure HO 3.10–9 identifies 34 SULMAs that are located underneath one or more airspace units. The SULMAs include wilderness and wilderness study areas (WSAs), national forests, NWRs, national recreation areas, national monuments, reservoirs, Native American reservation lands, and state parks. Baseline noise data associated with the SULMAs are identified in the table. For the SULMAs, the highest subsonic noise level is 63 DNL_{mr}. Supersonic operations to support

the F-35A mission would occur within Cato and Pecos MOAs, R-5107 (Yonder), R-5107 (Mesa H/L), R-5103 (McGregor), R-5107B, and R-5107B/D. The highest supersonic noise level is 52 CDNL, and the highest number of daily sonic booms is less than two.

Auxiliary Airfields

Biggs AAF

Fort Bliss, Texas and New Mexico Mission and Master Plan (Army 2007). The Mission and Master Plan addresses air operations, land uses, and other functions at Fort Bliss and other associated facilities, including Biggs AAF.

Biggs AAF is located on approximately 6,343 acres to the north and east of the main cantonment area within Fort Bliss in El Paso County, Texas. It provides full airfield services for all U.S. military services, the U.S. Department of Justice, and other government flight detachments. It also serves as an aerial departure point for deployable units at Fort Bliss, as well as approximately 115 Army Reserve/National Guard units (Army 2000). Approximately 257 acres and a population of 638 persons are located under the 65 dB or greater contours outside of Biggs AAF.

Fort Bliss has retained a perpetual easement from the City of El Paso for a strip of land along the southeastern boundary line between Biggs AAF and EPIA. An unpaved roadway in this easement provides access to the northern end of the airfield and training areas to the north.

RIAC

RIAC is located on 4,600 acres of land 5 miles south of the central business district of the city of Roswell in Chaves County, New Mexico. The airport is operated by the City of Roswell and contains three runways. Approximately 3,703 acres and a population of 61 persons are located under the 65 dB or greater contours on- and off-airport at RIAC.

Recreation

The land underlying Holloman AFB training airspace is a mosaic of Federal, state, and private ownership, used for a range of outdoor recreational activities. The most popular recreational uses include hunting; camping; hiking; nature viewing and photography; harvesting and gathering wood, plants, and berries; scenic driving; and trail riding (both on bikes and all-terrain vehicles). Land underlying the MOAs and MTRs is mostly managed by BLM, the U.S. Forest Service, and Mescalero Apache tribe, and lands under the restricted airspace are predominantly owned by DoD. The affected region includes several camping sites, the Apache Ski area, one national park (Guadalupe Mountains), four national forests (Apache, Lincoln, Cibola, and Gila), three wilderness areas and about 12 WSAs, two NWRs (San Andres and Sevilleta), and four state parks (Valley of Fires, Sumner Lake, Living Desert, and Oliver Lee Memorial). The area includes two national monuments, the Salinas Pueblo Missions (which is broken into three units, including the Gran Quivira, Abo, and Quarai) and WHSA, both open daily. Annual visitation at these monuments was approximately 38,000 and 472,000, respectively, in 2009 (NPS 2010b). The airspace also overlies a small portion of the Guadalupe Mountains National Park. The Trinity Site on WSMR, where the first atomic bomb was

detonated, is open twice annually for the public. Otero Mesa on McGregor Range (under R-5103) is popular for recreational wildlife viewing, enjoying solitude in a natural setting, and hunting. Figure HO 3.10–9 shows SULMAs underlying the primary use airspace identified for F-35A training.

Hot air ballooning, both as a recreational sport and for commercial tourism, is popular in New Mexico, particularly in the vicinity of the larger towns and cities. Paragliding is also popular in the region at select locations due to relatively predictable strong convectional air currents.

Auxiliary Airfields

Biggs AAF. Fort Bliss has several outdoor recreational facilities, including swimming pools, golf courses, a track, ball courts, and fields.

The City of El Paso has several parks in the area underlying relevant airspace (including five municipal/public golf courses), with several parks located between Dyer Road and Railroad Road along the western side of the Fort Bliss Main Cantonment and Southern Training Areas. Table HO 3.10–5 lists the public recreational sites within the area affected by noise levels above 65 dB under the Holloman AFB alternative scenarios.

Table HO 3.10–5. Recreational Amenities Around Biggs AAF and EPIA

Recreational Amenity	*Type/Activities*	*Current Noise Level (dB)*	*Compatibility*
Raynolds Median	Linear park, walking	< 65	Yes
Normandy Park	Pocket park	< 65	Yes
Mesa Terrace Park	Pocket park	< 65	Yes
Loretto-Lincoln Park	Neighborhood park	< 65	Yes
Lincoln Park	Community park and center	< 65	Yes
Washington Park	Neighborhood park	< 65	Yes
Chelsea (outdoor pool)	Swimming	< 65	Yes

Source: El Paso 2010.

Franklin Mountains State Park, located on the eastern boundary of El Paso, at 24,247 acres, is the largest urban park in the United States and provides hiking, camping, rock climbing, and other recreational activities (TPW 2009).

EPIA. EPIA is in close proximity to Biggs AAF. Recreation surrounding EPIA is described above for Biggs AAF. Directly east of EPIA is the Butterfield Trail Golf Course, a municipal amenity.

RIAC. Most of the recreational facilities and attractions in the Roswell area are located either in the urbanized area (such as swimming pools, New Mexico Military Institute Golf Course, Spring River Golf Course, Spring River Park, Hondo Park, Cahoon Park, and outdoor ball fields), or at some distance from RIAC. Sunset Elementary School, located directly north of RIAC, has outdoor play areas. Bitter Lakes NWR provides wildlife viewing approximately 9 miles to the northeast. Bottomless Lakes State Park, popular for camping, scuba diving, swimming, and fishing, is located approximately 14 miles to the southeast.

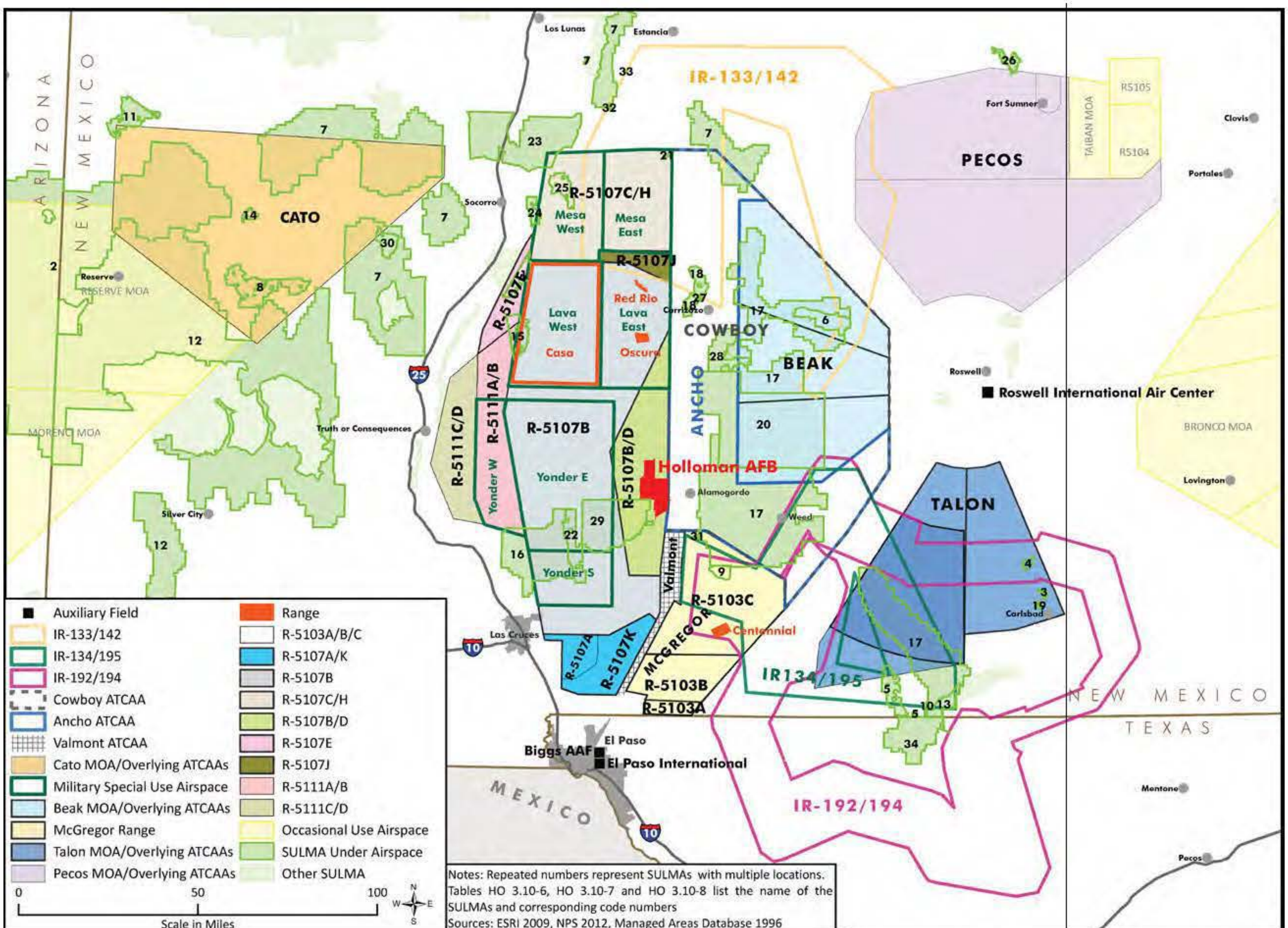


Figure HO 3.10–9. SULMAs and Airspace for Holloman AFB, New Mexico

HO 3.10.2.2 Airspace Environmental Consequences

Land Use

F-35A flight activities would take place in existing airspace. No airspace modifications would be required under any of the scenarios. Airspace training operations would be consistent with existing airspace operations and would comply with established range and land management plans. Furthermore, safety guidelines and existing range management and land use plans would be updated to address F-35A operations, as necessary. Noise exposure associated with F-35A operations within the airspace is discussed further in Section HO 3.2.

Noise compatibility considerations may differ for various types of SULMAs. Recreational areas, for example, vary in the degree to which quiet is desirable and necessary for a high-quality recreation experience; how much of an area is devoted to developed and undeveloped recreation and the remoteness of the area are also factors. Managers of wildlife areas and preserves frequently consider sensitivity of wildlife to noise, such as startle effects due to sudden changes in noise. Noise impacts on recreation and wildlife are addressed separately in the Recreation section below and in Sections HO 3.6, HO 3.7, and HO 3.8.

Noise modeled for each individual airspace unit was evaluated using GIS techniques to determine if there would be land use impacts on SULMAs located wholly or partially underneath the airspace. For SULMAs that are partially under airspace, noise in areas adjacent to airspace tends to fall off dramatically, particularly because pilots typically fly closer to the center of the airspace. The airspace noise modeling reflects this by tapering the density of operations down toward the edge of a MOA, for example. In other cases, a SULMA may be located underneath more than one airspace unit or airspace units that overlap each other, for example, a MOA that overlaps an MTR. The experience of MTR overflight is different from MOA overflight. MTR overflights are fast, low, and typically single events, while MOA overflights occur at higher altitudes and are potentially repeated. Note that differences in instantaneous noise levels of less than 3 dB are typically imperceptible to persons with normal hearing in non-laboratory settings. Section HO 3.2 discusses noise characteristics and different noise metrics in greater detail.

Sonic boom noise within the airspace is quite different from subsonic noise, which may occur in the same airspace, although both can result in annoyance. Sonic booms experienced in SULMAs could startle or disturb public recreation users and/or wildlife. In addition, changes in the total number of overflights that could affect recreation areas are addressed in the Recreation section.

Tables HO 3.10–6 through HO 3.10–8 display the projected incremental changes to subsonic noise levels, supersonic noise levels, and daily sonic booms in individual airspace units and associated SULMAS under each F-35A scenario.

The vast majority of noise from air-to-ground use of ranges for projected F-35A munitions training was assumed to occur within the ranges themselves and would have negligible effects on SULMAs and other land uses outside the ranges.

Table HO 3.10–6. Subsonic Noise Levels (DNL_{mr}) by Airspace and Associated SULMAs for Holloman AFB Primary Airspace, Baseline Conditions and F-35A Beddown Scenarios

				Baseline Conditions	*Scenario H1W (24 Aircraft)*		*Scenario H2W (48 Aircraft)*		*Scenario H3W (72 Aircraft)*		*Scenario H1 (24 Aircraft)*		*Scenario H2 (48 Aircraft)*		*Scenario H3 (72 Aircraft)*		*Scenario H4 (96 Aircraft)*		*Scenario H5 (120 Aircraft)*	
SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
Beak MOA and overlying ATCAAs																				
6	Capitan Mountains Wilderness	35,698	100	< 45	45	0	47	2	49	4	< 45	0	47	2	48	3	50	5	51	6
7	Cibola National Forest	1,949,394	2	< 45	45	0	47	2	49	4	< 45	0	47	2	48	3	50	5	51	6
17	Lincoln National Forest	1,182,587	71	< 45	45	0	47	2	49	4	< 45	0	47	2	48	3	50	5	51	6
18	Little Black Peak Carrizozo Lava Flow WSA	25,517	100	< 45	45	0	47	2	49	4	< 45	0	47	2	48	3	50	5	51	6
20	Mescalero Apache Indian Reservation	459,600	100	< 45	45	0	47	2	49	4	< 45	0	47	2	48	3	50	5	51	6
27	Valley of Fires SP	552	100	< 45	45	0	47	2	49	4	< 45	0	47	2	48	3	50	5	51	6
28	White Mountain Wilderness	45,779	100	< 45	45	0	47	2	49	4	< 45	0	47	2	48	3	50	5	51	6
Cato MOA																				
2	Apache National Forest	1,806,562	21	< 45	< 45	0	45	0	46	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	Cibola National Forest	1,949,394	20	< 45	< 45	0	45	0	46	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8	Continental Divide WSA	70,698	100	< 45	< 45	0	45	0	46	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11	Eagle Peak WSA	42,221	7	< 45	< 45	0	45	0	46	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12	Gila National Forest	1,982,018	11	< 45	< 45	0	45	0	46	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Horse Mountain WSA	5,421	100	< 45	< 45	0	45	0	46	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30	Withington Wilderness	18,996	7	< 45	< 45	0	45	0	46	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario H1W (24 Aircraft)		Scenario H2W (48 Aircraft)		Scenario H3W (72 Aircraft)		Scenario H1 (24 Aircraft)		Scenario H2 (48 Aircraft)		Scenario H3 (72 Aircraft)		Scenario H4 (96 Aircraft)		Scenario H5 (120 Aircraft)	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
IR-133/142																				
6	Capitan Mountains Wilderness	35,698	22	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7
7	Cibola National Forest	1,949,394	3	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7
17	Lincoln National Forest	1,182,587	2	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7
18	Little Black Peak Carrizozo Lava Flow WSA	25,517	62	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7
20	Mescalero Apache Indian Reservation	459,600	< 1	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7
21	Salinas Pueblo Missions National Monument (Gran Quivira Unit)	597	100	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7
30	Salinas Pueblo Missions National Monument (Abo Unit)	360	100	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7
31	Salinas Pueblo Missions National Monument (Quarai Unit)	105	79	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7
27	Valley of Fires SP	552	20	55	57	2	59	4	60	5	57	2	59	4	60	5	61	6	62	7

				Baseline Conditions	Scenario H1W (24 Aircraft)		Scenario H2W (48 Aircraft)		Scenario H3W (72 Aircraft)		Scenario H1 (24 Aircraft)		Scenario H2 (48 Aircraft)		Scenario H3 (72 Aircraft)		Scenario H4 (96 Aircraft)		Scenario H5 (120 Aircraft)	
SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
IR-134/195																				
5	Brokeoff Mountains WSA	31,140	70	49	52	3	53	4	54	5	52	3	53	4	54	5	55	6	56	7
9	Culp Canyon WSA	11,071	100	49	52	3	53	4	54	5	52	3	53	4	54	5	55	6	56	7
10	Devil's Den Canyon WSA	774	63	49	52	3	53	4	54	5	52	3	53	4	54	5	55	6	56	7
13	Guadalupe Escarpment WSA	20,467	56	49	52	3	53	4	54	5	52	3	53	4	54	5	55	6	56	7
32	Carlsbad Caverns NP	46,797	<1	49	52	3	53	4	54	5	52	3	53	4	54	5	55	6	56	7
17	Lincoln National Forest	1,182,587	34	49	52	3	53	4	54	5	52	3	53	4	54	5	55	6	56	7
IR-192/194																				
4	Brantley Reservoir	4,362	100	53	56	3	57	4	58	5	56	3	57	4	58	5	59	6	60	7
9	Culp Canyon WSA	11,071	100	53	56	3	57	4	58	5	56	3	57	4	58	5	59	6	60	7
17	Lincoln National Forest	1,182,587	12	53	56	3	57	4	58	5	56	3	57	4	58	5	59	6	60	7
33	Guadalupe Mountains NP	87,224	<1	53	56	3	57	4	58	5	56	3	57	4	58	5	59	6	60	7
20	Mescalero Apache Indian Reservation	459,600	1	53	56	3	57	4	58	5	56	3	57	4	58	5	59	6	60	7
R-5107 (Lava E/W)																				
1	Antelope WSA	21,480	13	61	63	2	64	3	64	3	62	1	64	3	64	3	65	4	66	5
15	Jornada Del Muerto WSA	29,558	54	61	63	2	64	3	64	3	62	1	64	3	64	3	65	4	66	5
R-5103 (McGregor)																				
9	Culp Canyon WSA	11,071	100	56	59	3	60	4	62	6	59	3	61	5	63	7	64	8	65	9
17	Lincoln National Forest	1,182,587	4	56	59	3	60	4	62	6	59	3	61	5	63	7	64	8	65	9
31	Oliver Lee Memorial SP	640	93	56	59	3	60	4	62	6	59	3	61	5	63	7	64	8	65	9

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario H1W (24 Aircraft)		Scenario H2W (48 Aircraft)		Scenario H3W (72 Aircraft)		Scenario H1 (24 Aircraft)		Scenario H2 (48 Aircraft)		Scenario H3 (72 Aircraft)		Scenario H4 (96 Aircraft)		Scenario H5 (120 Aircraft)	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
R-5107 (Mesa L/H)																				
21	Salinas Pueblo Missions National Monument (Gran Quivira)	1,172	100	63	63	0	64	1	64	1	63	0	64	1	64	1	65	2	65	2
23	Sevilleta NWR	224,623	3	63	63	0	64	1	64	1	63	0	64	1	64	1	65	2	65	2
24	Sierra de Las Canas WSA	12,320	18	63	63	0	64	1	64	1	63	0	64	1	64	1	65	2	65	2
25	Stallion WSA	21,574	100	63	63	0	64	1	64	1	63	0	64	1	64	1	65	2	65	2
Pecos MOA																				
26	Sumner Lake SP	11,845	6	< 45	46	1	48	3	49	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Talon MOA																				
3	Avalon Reservoir	1,578	100	54	57	3	58	4	59	5	53	(1)	55	1	56	2	57	3	58	4
4	Brantley Reservoir	4,362	100	54	57	3	58	4	59	5	53	(1)	55	1	56	2	57	3	58	4
5	Brokeoff Mountains WSA	31,140	14	54	57	3	58	4	59	5	53	(1)	55	1	56	2	57	3	58	4
17	Lincoln National Forest	1,182,587	17	54	57	3	58	4	59	5	53	(1)	55	1	56	2	57	3	58	4
19	Living Desert SP	1,015	100	54	57	3	58	4	59	5	53	(1)	55	1	56	2	57	3	58	4
R-5107 (Yonder)																				
16	Jornada Experimental Range	183,210	65	63	63	0	64	1	65	2	63	0	64	1	65	2	65	2	66	3
22	San Andres NWR	40,882	100	63	63	0	64	1	65	2	63	0	64	1	65	2	65	2	66	3
29	WHSA	145,812	51	63	63	0	64	1	65	2	63	0	64	1	65	2	65	2	66	3

				Baseline Conditions	Scenario H1W (24 Aircraft)		Scenario H2W (48 Aircraft)		Scenario H3W (72 Aircraft)		Scenario H1 (24 Aircraft)		Scenario H2 (48 Aircraft)		Scenario H3 (72 Aircraft)		Scenario H4 (96 Aircraft)		Scenario H5 (120 Aircraft)	
SULMA No.	***SULMA Name***	***SULMA Acreage***	***Percentage of SULMA Under Airspace***	DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
R-5107B																				
29	WHSA	145,812	15	63	63	0	64	1	65	2	63	0	64	1	65	2	65	2	66	3
R-5107B/D																				
29	WHSA	145,812	34	63	63	0	64	1	65	2	63	0	64	1	65	2	65	2	66	3

Note: (Number) denotes a negative number. Portions of R-5107B and B/D outside of the Yonder and Lava Ranges and over WHSA may experience some noise from F-35A aircraft in transit to training areas. Noise levels indicated in the table are conservative (high) estimates for underlying areas.

Key: SP=state park.

Source: ESRI 2009; Managed Area Database 1996; NPS 2012.

Table HO 3.10–7. Supersonic Noise Levels (CDNL) by Airspace and Associated SULMAs for Holloman AFB Primary Airspace, Baseline Conditions and F-35A Beddown Scenarios

				Baseline Conditions	*Scenario H1W (24 Aircraft)*		*Scenario H2W (48 Aircraft)*		*Scenario H3W (72 Aircraft)*		*Scenario H1 (24 Aircraft)*		*Scenario H2 (48 Aircraft)*		*Scenario H3 (72 Aircraft)*		*Scenario H4 (96 Aircraft)*		*Scenario H5 (120 Aircraft)*	
SULMA No.	***SULMA Name***	***SULMA Acreage***	***Percentage of SULMA Under Airspace***	**CDNL**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**
Beak MOA and overlying ATCAAs																				
6	Capitan Mountains Wilderness	35,698	100	49	50	1	50	1	50	1	46	(3)	46	(3)	47	(2)	47	(2)	48	(1)
7	Cibola National Forest	1,949,394	2	49	50	1	50	1	50	1	46	(3)	46	(3)	47	(2)	47	(2)	48	(1)
17	Lincoln National Forest	1,182,587	71	49	50	1	50	1	50	1	46	(3)	46	(3)	47	(2)	47	(2)	48	(1)
18	Little Black Peak Carrizozo Lava Flow WSA	25,517	100	49	50	1	50	1	50	1	46	(3)	46	(3)	47	(2)	47	(2)	48	(1)
20	Mescalero Apache Indian Reservation	459,600	100	49	50	1	50	1	50	1	46	(3)	46	(3)	47	(2)	47	(2)	48	(1)
27	Valley of Fires SP	552	100	49	50	1	50	1	50	1	46	(3)	46	(3)	47	(2)	47	(2)	48	(1)
28	White Mountain Wilderness	45,779	100	49	50	1	50	1	50	1	46	(3)	46	(3)	47	(2)	47	(2)	48	(1)

				Baseline Conditions	***Scenario H1W (24 Aircraft)***		***Scenario H2W (48 Aircraft)***		***Scenario H3W (72 Aircraft)***		***Scenario H1 (24 Aircraft)***		***Scenario H2 (48 Aircraft)***		***Scenario H3 (72 Aircraft)***		***Scenario H4 (96 Aircraft)***		***Scenario H5 (120 Aircraft)***	
SULMA No.	***SULMA Name***	***SULMA Acreage***	***Percentage of SULMA Under Airspace***	**CDNL**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**
Cato MOA																				
2	Apache National Forest	1,806,562	21	< 45	< 45	0	< 45	0	< 45	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	Cibola National Forest	1,949,394	20	< 45	< 45	0	< 45	0	< 45	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8	Continental Divide WSA	70,698	100	< 45	< 45	0	< 45	0	< 45	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11	Eagle Peak WSA	42,221	7	< 45	< 45	0	< 45	0	< 45	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12	Gila National Forest	1,982,018	11	< 45	< 45	0	< 45	0	< 45	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Horse Mountain WSA	5,421	100	< 45	< 45	0	< 45	0	< 45	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30	Withington Wilderness	18,996	7	< 45	< 45	0	< 45	0	< 45	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R-5107 (Lava E/W)																				
1	Antelope WSA	21,480	13	52	52	0	52	0	53	1	52	0	52	0	52	0	52	0	52	0
15	Jornada Del Muerto WSA	29,558	54	52	52	0	52	0	53	1	52	0	52	0	52	0	52	0	52	0
R-5103 (McGregor)																				
9	Culp Canyon WSA	11,071	100	45	46	1	47	2	47	2	45	0	46	1	46	1	47	2	48	3
17	Lincoln National Forest	1,182,587	4	45	46	1	47	2	47	2	45	0	46	1	46	1	47	2	48	3
31	Oliver Lee Memorial SP	640	93	45	46	1	47	2	47	2	45	0	46	1	46	1	47	2	48	3

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario H1W (24 Aircraft)		Scenario H2W (48 Aircraft)		Scenario H3W (72 Aircraft)		Scenario H1 (24 Aircraft)		Scenario H2 (48 Aircraft)		Scenario H3 (72 Aircraft)		Scenario H4 (96 Aircraft)		Scenario H5 (120 Aircraft)	
				CDNL	CDNL	Change	CDNL	Change	CDNL	Change	CDNL	Change	CDNL	Change	CDNL	Change	CDNL	Change	CDNL	Change
R-5107 (Mesa L/H)																				
21	Salinas Pueblo Missions National Monument (Gran Quivira)	1,172	100	52	52	0	52	0	52	0	52	0	52	0	52	0	52	0	52	0
23	Sevilleta NWR	224,623	3	52	52	0	52	0	52	0	52	0	52	0	52	0	52	0	52	0
24	Sierra de Las Canas WSA	12,320	18	52	52	0	52	0	52	0	52	0	52	0	52	0	52	0	52	0
25	Stallion WSA	21,574	100	52	52	0	52	0	52	0	52	0	52	0	52	0	52	0	52	0
Pecos MOA																				
26	Sumner Lake SP	11,845	6	46	47	0	47	1	47	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R-5107 (Yonder)																				
16	Jornada Experimental Range	183,210	65	53	53	0	53	0	53	0	51	(2)	51	(2)	51	(2)	52	(1)	52	(1)
22	San Andres NWR	40,882	100	53	53	0	53	0	53	0	51	(2)	51	(2)	51	(2)	52	(1)	52	(1)
29	WHSA	145,812	51	53	53	0	53	0	53	0	51	(2)	51	(2)	51	(2)	52	(1)	52	(1)
R-5107B[1]																				
29	WHSA	145,812	15	53	53	0	53	0	53	0	51	(2)	51	(2)	51	(2)	52	(1)	52	(1)
R-5107B/D[1]																				
29	WHSA	145,812	34	53	53	0	53	0	53	0	51	(2)	51	(2)	51	(2)	52	(1)	52	(1)

[1] Portions of R-5107B and B/D outside of the Yonder and Lava Ranges and over WHSA may experience some noise from F-35A aircraft in transit to training areas. Noise levels indicated in the table are conservative (high) estimates for underlying areas.

Note: (Number) denotes a negative number.

Source: ESRI 2009; Managed Areas Database 1996; NPS 2012.

Table HO 3.10–8. Sonic Booms per Day by Airspace and Associated SULMAs for Holloman AFB Primary Airspace, Baseline Conditions and F-35A Beddown Scenarios

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario H1W (24 Aircraft)		Scenario H2W (48 Aircraft)		Scenario H3W (72 Aircraft)		Scenario H1 (24 Aircraft)		Scenario H2 (48 Aircraft)		Scenario H3 (72 Aircraft)		Scenario H4 (96 Aircraft)		Scenario H5 (120 Aircraft)	
				Booms/Day	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change		
Beak MOA and overlying ATCAAs																						
6	Capitan Mountains Wilderness	35,698	100	1.4	1.6	0.2	1.7	0.3	1.8	0.4	1	(0.4)	1.2	(0.2)	1.3	(0.1)	1.5	0.1	1.6	0.2		
7	Cibola National Forest	1,949,394	2	1.4	1.6	0.2	1.7	0.3	1.8	0.4	1	(0.4)	1.2	(0.2)	1.3	(0.1)	1.5	0.1	1.6	0.2		
17	Lincoln National Forest	1,182,587	71	1.4	1.6	0.2	1.7	0.3	1.8	0.4	1	(0.4)	1.2	(0.2)	1.3	(0.1)	1.5	0.1	1.6	0.2		
18	Little Black Peak Carrizozo Lava Flow WSA	25,517	100	1.4	1.6	0.2	1.7	0.3	1.8	0.4	1	(0.4)	1.2	(0.2)	1.3	(0.1)	1.5	0.1	1.6	0.2		
20	Mescalero Apache Indian Reservation	459,600	100	1.4	1.6	0.2	1.7	0.3	1.8	0.4	1	(0.4)	1.2	(0.2)	1.3	(0.1)	1.5	0.1	1.6	0.2		
27	Valley of Fires SP	552	100	1.4	1.6	0.2	1.7	0.3	1.8	0.4	1	(0.4)	1.2	(0.2)	1.3	(0.1)	1.5	0.1	1.6	0.2		
28	White Mountain Wilderness	45,779	100	1.4	1.6	0.2	1.7	0.3	1.8	0.4	1	(0.4)	1.2	(0.2)	1.3	(0.1)	1.5	0.1	1.6	0.2		

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario H1W (24 Aircraft)		Scenario H2W (48 Aircraft)		Scenario H3W (72 Aircraft)		Scenario H1 (24 Aircraft)		Scenario H2 (48 Aircraft)		Scenario H3 (72 Aircraft)		Scenario H4 (96 Aircraft)		Scenario H5 (120 Aircraft)	
				Booms/Day	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change
Cato MOA																				
2	Apache National Forest	1,806,562	21	0.1	0.1	0	0.1	0	0.2	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	Cibola National Forest	1,949,394	20	0.1	0.1	0	0.1	0	0.2	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8	Continental Divide WSA	70,698	100	0.1	0.1	0	0.1	0	0.2	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11	Eagle Peak WSA	42,221	7	0.1	0.1	0	0.1	0	0.2	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12	Gila National Forest	1,982,018	11	0.1	0.1	0	0.1	0	0.2	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Horse Mountain WSA	5,421	100	0.1	0.1	0	0.1	0	0.2	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30	Withington Wilderness	18,996	7	0.1	0.1	0	0.1	0	0.2	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R-5107 (Lava E/W)																				
1	Antelope WSA	21,480	13	1.5	1.6	0.1	1.6	0.1	1.7	0.1	1.4	(0.1)	1.5	0	1.5	0	1.6	0.1	1.7	0.2
15	Jornada Del Muerto WSA	29,558	54	1.5	1.6	0.1	1.6	0.1	1.7	0.1	1.4	(0.1)	1.5	0	1.5	0	1.6	0.1	1.7	0.2
R-5103 (McGregor)																				
9	Culp Canyon WSA	11,071	100	0.3	0.4	0.1	0.5	0.2	0.5	0.2	0.3	0	0.4	0.1	0.4	0.1	0.5	0.2	0.5	0.2
17	Lincoln National Forest	1,182,587	4	0.3	0.4	0.1	0.5	0.2	0.5	0.2	0.3	0	0.4	0.1	0.4	0.1	0.5	0.2	0.5	0.2
31	Oliver Lee Memorial SP	640	93	0.3	0.4	0.1	0.5	0.2	0.5	0.2	0.3	0	0.4	0.1	0.4	0.1	0.5	0.2	0.5	0.2

				Baseline Conditions	Scenario H1W (24 Aircraft)		Scenario H2W (48 Aircraft)		Scenario H3W (72 Aircraft)		Scenario H1 (24 Aircraft)		Scenario H2 (48 Aircraft)		Scenario H3 (72 Aircraft)		Scenario H4 (96 Aircraft)		Scenario H5 (120 Aircraft)	
SULMA No.	***SULMA Name***	***SULMA Acreage***	***Percentage of SULMA Under Airspace***	**Booms/Day**	**Booms/Day**	**Change**	**Booms/Day**	**Change**	**Booms/Day**	**Change**	**Booms/Day**	**Change**	**Booms/Day**	**Change**	**Booms/Day**	**Change**	**Booms/Day**	**Change**	**Booms/Day**	**Change**
R-5107 (Mesa L/H)																				
21	Salinas Pueblo Missions National Monument (Gran Quivira)	1,172	100	1.5	1.6	0.1	1.6	0.1	1.6	0.1	1.4	(0.1)	1.4	(0.1)	1.4	(0.1)	1.5	0	1.5	0
23	Sevilleta NWR	224,623	3	1.5	1.6	0.1	1.6	0.1	1.6	0.1	1.4	(0.1)	1.4	(0.1)	1.4	(0.1)	1.5	0	1.5	0
24	Sierra de Las Canas WSA	12,320	18	1.5	1.6	0.1	1.6	0.1	1.6	0.1	1.4	(0.1)	1.4	(0.1)	1.4	(0.1)	1.5	0	1.5	0
25	Stallion WSA	21,574	100	1.5	1.6	0.1	1.6	0.1	1.6	0.1	1.4	(0.1)	1.4	(0.1)	1.4	(0.1)	1.5	0	1.5	0
Pecos MOA																				
26	Sumner Lake SP	11,845	6	0.4	0.4	0	0.5	0.1	0.5	0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R-5107 (Yonder)																				
16	Jornada Experimenta l Range	183,210	65	1.8	1.8	0	1.8	0.1	1.9	0.1	1.3	(0.5)	1.3	(0.5)	1.3	(0.5)	1.4	(0.4)	1.4	(0.4)
22	San Andres NWR	40,882	100	1.8	1.8	0	1.8	0.1	1.9	0.1	1.3	(0.5)	1.3	(0.5)	1.3	(0.5)	1.4	(0.4)	1.4	(0.4)
29	WHSA	145,812	51	1.8	1.8	0	1.8	0.1	1.9	0.1	1.3	(0.5)	1.3	(0.5)	1.3	(0.5)	1.4	(0.4)	1.4	(0.4)
R-5107B[1]																				
29	WHSA	145,812	15	1.8	1.8	0	1.8	0.1	1.9	0.1	1.3	(0.5)	1.3	(0.5)	1.3	(0.5)	1.4	(0.4)	1.4	(0.4)
R-5107B/D[1]																				
29	WHSA	145,812	34	1.8	1.8	0	1.8	0.1	1.9	0.1	1.3	(0.5)	1.3	(0.5)	1.3	(0.5)	1.4	(0.4)	1.4	(0.4)

[1] Portions of R-5107B and B/D outside of the Yonder and Lava Ranges and over WHSA may experience some noise from F-35A aircraft in transit to training areas. Noise levels indicated in the table are conservative (high) estimates for underlying areas.

Note: (Number) denotes a negative number. Supersonic operations are not authorized in the Beak MOAs or the Talon MOAs.

Source: ESRI 2009; Managed Areas Database 1996; NPS 2012.

Scenario H1W. Under Scenario H1W, the projected F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from no change to an increase of 3 dB DNL_{mr}. Noise levels in the airspace are projected to be between less than 45 and 63 dB DNL_{mr}.

Changes in supersonic noise, compared with baseline conditions, would range from no change to an increase of 1 dB CDNL. Noise levels in the airspace are projected to be between less than 45 and 53 dB CDNL. Supersonic training would be conducted only in those airspace units in which it is currently permitted.

Changes in the average number of sonic booms per day, compared with baseline conditions, would range from no change to an increase of 0.2 booms per day. The total number of daily sonic booms for any single airspace unit is projected to be between 0.1 and 1.8.

Federal agencies are generally mandated to manage wilderness areas for their wilderness qualities, for example, maintaining the natural setting and allowing minimal human disturbance and development. Wilderness management goals could be negatively affected by increased noise and disturbance associated with military overflights. The quality of recreation experiences in wilderness areas, recreation areas, and other specially managed lands could also be affected, depending upon the type of recreation and remoteness of the area.

Scenario H2W. Under Scenario H2W, the F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from no change to 4 dB DNL_{mr}. Noise levels in the airspace are projected to be between 45 and 64 dB DNL_{mr}.

Changes in supersonic noise, compared with baseline conditions, would range from no change to an increase of 1 dB CDNL. Noise levels in the airspace are projected to be between less than 45 and 53 dB CDNL. Changes in the average number of sonic booms per day, compared with baseline conditions, would range from no change to an increase of 0.3 booms per day. The total number of daily sonic booms for any single airspace unit is projected to be between 0.1 and 1.8.

Scenario H3W. Under Scenario H3W, the F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from an increase of 1 dB to 5 dB DNL_{mr}. Noise levels in the airspace are projected to be between 46 and 65 dB DNL_{mr}.

Changes in supersonic noise, compared with baseline conditions, would range from no change to an increase of 2 dB CDNL. Noise levels under the airspace are projected to be between less than 45 and 53 dB CDNL. Changes in the average number of sonic booms per day, compared with baseline conditions, would range from an increase of 0.1 to 0.4 booms per day. The total number of daily sonic booms for any single airspace unit is projected to be between 0.2 and 1.9.

Scenario H1. Under Scenario H1, the F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from a decrease of 1 dB to an increase of 3 dB DNL_{mr}. Noise levels in the airspace are projected to be between less than 45 and 63 dB DNL_{mr}.

Changes in supersonic noise, compared with baseline conditions, would range from a decrease of 3 dB to no change. Noise levels in the airspace are projected to be between 45 and 52 dB

CDNL. Changes in the average number of sonic booms per day, compared with baseline conditions, would range from a decrease of 0.5 to no change in the number of booms per day. The total number of daily sonic booms for any single airspace unit is projected to be between 1.0 and 1.4.

Scenario H2. Under Scenario H2, the F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from an increase of 1 dB to 4 dB DNL_{mr}. Noise levels in the airspace are projected to be between 47 and 64 dB DNL_{mr}.

Changes in supersonic noise, compared with baseline conditions, would range from a decrease of 3 dB to an increase of 1 dB CDNL. Noise levels under the airspace are projected to be between 46 and 52 dB CDNL. Changes in the average number of sonic booms per day, compared with baseline conditions, would range from a decrease of 0.5 to an increase of 0.1 booms per day. The total number of daily sonic booms for any single airspace unit is projected to be between 0.4 and 1.4.

Scenario H3. Under Scenario H3, the F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from an increase of 1 dB to 7 dB DNL_{mr}. Noise levels in the airspace are projected to be between 48 and 64 dB DNL_{mr}

Changes in supersonic noise, compared with baseline conditions, would range from a decrease of 2 dB to an increase of 1 dB. Noise levels under the airspace are projected to be between 46 and 52 dB CDNL. Changes in the average number of sonic booms per day, compared with baseline conditions, would range from a decrease of 0.5 to an increase of 0.1 booms per day. The total number of daily sonic booms for any single airspace unit is projected to be between 0.4 and 1.5.

Scenario H4. Under Scenario H4, the F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from an increase of 2 dB to 8 dB. Noise levels in the airspace are projected to be between 50 and 65 dB DNL_{mr}. Noise levels of 65 dB DNL_{mr} could affect areas underlying R-5107 (Yonder) and R-5107 (Mesa L/H), including WSAs, national monuments, a national wildlife refuge, and an experimental range (see Table 3.10–6).

Changes in supersonic noise, compared with baseline conditions, would range from a decrease of 2 dB to an increase of 2 dB. Noise levels in the airspace are projected to be between 47 and 52 dB CDNL. Changes in the average number of sonic booms per day, compared with baseline conditions, would range from a decrease of 0.4 to an increase of 0.2 booms per day. The total number of daily sonic booms for any single airspace unit is projected to be between 0.5 and 1.6.

Scenario H5. Under Scenario H5, the F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from an increase of 2 dB to 9 dB DNL_{mr}. Noise levels in the airspace are projected to be between 51 and 66 dB DNL_{mr}. Noise levels of 65 dB and 66 dB DNL_{mr} could affect areas underlying R-5107 (Yonder) and R-5107 (Mesa L/H), as mentioned in Scenario H4. In addition, noise levels of 65 dB DNL_{mr} could affect areas underlying R-5107 (Lava E/W) and R-5103 (McGregor), respectively, including WSAs, a national forest, and a state park.

Changes in supersonic noise, compared with baseline conditions, would range from a decrease of 1 dB to an increase of 3 dB. Noise levels in the airspace are projected to be between 48 and 52 dB CDNL. Changes in the average number of sonic booms per day, compared with baseline conditions, would range from a decrease of 0.4 to an increase of 0.2 booms per day. The total number of daily sonic booms for any single airspace unit is projected to be between 0.5 and 1.7.

Auxiliary Airfields

Biggs AAF. There would be no construction at Biggs AAF under any of the F-35A aircraft scenarios. The off-installation area within the 65 dB DNL or greater noise contour would increase by between 2 acres (under Scenarios H1W and H1) and 13 acres (under Scenario H5), compared with baseline noise contours. The estimated number of off-installation residents affected by projected noise increase would increase by between 29 persons (under Scenarios H1W and H1) and 148 persons (under Scenario H5).

EPIA. There would be no construction at EPIA under any of the F-35A aircraft scenarios. The off-installation area affected by noise levels of 65 dB DNL or greater would increase by between 187 acres (under Scenario H1 and H1W) and 686 acres (under Scenario H5) relative to baseline conditions. The estimated number of off-installation residents affected by projected noise levels greater than 65 dB DNL would increase by between 348 persons (under Scenarios H1W and H1) and 1,884 persons (under Scenario H5).

RIAC. There would be no construction at RIAC under any of the F-35A aircraft scenarios. The total area within the 65 dB DNL or greater noise contour would increase by between 781 acres (under Scenario H2) and 2,102 (under Scenario H5); Scenarios H1W, H2W, and H3 would have increases within this numeric range. Under Scenario H1, noise levels in the vicinity of RIAC would decrease the area within the 65 dB DNL or greater noise contour by 277 acres compared with baseline noise contours. The estimated number of off-installation residents affected by the projected noise levels greater than 65 dB DNL would increase by between 5 persons under Scenario H1 and 497 persons under Scenario H5.

Recreation

A synopsis of issues and methodology for addressing potential impacts from military training on recreational resources underlying training airspace are provided in Chapter 3, Section 3.8. It describes typical recreational impacts common to all scenarios. More specific changes for recreational resources affected by the F-35A staging at Holloman AFB are described below.

In general, a diverse range of active and passive recreational activities occurring throughout the region already coexists within a context of some exposure to military overflight. Increased average noise levels and increased numbers of operations would increase the probability that recreational participants would experience noise and startle effects from these activities. This could cause some degradation in enjoyment for those affected and loss of opportunity for quiet recreational environments in the region. Table HO 3.10–9 lists the recreational resources under each training airspace, the current and estimated noise levels (both DNL_{mr} and CDNL), and the average number of sonic booms per day for each of the F-35A beddown scenarios. Table HO 3.10–10 provides the average number of sorties in each airspace and lists the underlying recreational resources. Because training would occur mostly on weekdays at Holloman AFB, noise levels experienced by persons engaged in recreational activities on

weekends would be much lower than average noise levels and daily sortie-operations presented in Tables HO 3.10–9 and HO 3.10–10.

Increased noise could diminish opportunities for visitors to experience natural soundscapes in national park units, and could similarly diminish the qualities of natural quiet that are intrinsic to recreational opportunities in wilderness areas, WSAs, and other remote locations. Table HO 3.10–9 shows that the primary use airspace units identified for F-35A training already support some military use and underlying areas are exposed to noise from this training. To some degree, these areas and recreational activities have coexisted for decades, with noise levels fluctuating and often reaching levels higher than current conditions. However, under all scenarios, increases in average noise levels are projected, with the exception of the Talon MOAs under Scenario H1.

Table HO 3.10–9 does not identify WSAs and special sites managed by BLM for particular resource values under training airspace. These areas are identified in Table HO 3.10–6. Many of these support recreational purposes in the affected region.

Table HO 3.10–9. Average Noise Levels by Airspace and Associated Recreational Use Areas[1]

Recreational Resource	*Scenario*	*DNL_{mr}*	*CDNL*	*Booms/Day*
Beak MOAs and Overlying ATCAAs				
Capitan Mountain Wilderness, White Mountain Wilderness, Ski Apache, Lincoln NF, Cibola NF, Little Black Peak Carrizozo Lava Flow WSA, Valley of Fires SP	Baseline	< 45	49	1.4
	Scenario H1W	45	50	1.6
	Scenario H2W	47	50	1.7
	Scenario H3W	49	50	1.8
	Scenario H1	< 45	46	1.0
	Scenario H2	47	46	1.2
	Scenario H3	48	47	1.3
	Scenario H4	50	47	1.5
	Scenario H5	51	48	1.6
Pecos MOA				
Sumner Lake SP	Baseline	< 45	46	0.4
	Scenario H1W	46	47	0.4
	Scenario H2W	48	47	0.5
	Scenario H3W	49	47	0.5
	Scenario H1	N/A	N/A	N/A
	Scenario H2	N/A	N/A	N/A
	Scenario H3	N/A	N/A	N/A
	Scenario H4	N/A	N/A	N/A
	Scenario H5	N/A	N/A	N/A
Cato MOA				
Withington Wilderness	Baseline	< 45	< 45	0.1
	Scenario H1W	< 45	< 45	0.1
	Scenario H2W	45	< 45	0.1
	Scenario H3W	46	< 45	0.2
	Scenario H1	N/A	N/A	N/A
	Scenario H2	N/A	N/A	N/A
	Scenario H3	N/A	N/A	N/A
	Scenario H4	N/A	N/A	N/A
	Scenario H5	N/A	N/A	N/A

Recreational Resource	*Scenario*	*DNL_{mr}*	*CDNL*	*Booms/Day*
Talon MOA				
Avalon Reservoir, Brantley Reservoir and SP, Living Desert SP, Lincoln NF	Baseline	54	N/A	N/A
	Scenario H1W	57	N/A	N/A
	Scenario H2W	58	N/A	N/A
	Scenario H3W	59	N/A	N/A
	Scenario H1	53	N/A	N/A
	Scenario H2	55	N/A	N/A
	Scenario H3	56	N/A	N/A
	Scenario H4	57	N/A	N/A
	Scenario H5	58	N/A	N/A
R-5107 (Red Rio)				
None	Baseline	59	48	0.6
	Scenario H1W	63	48	0.6
	Scenario H2W	65	48	0.6
	Scenario H3W	66	48	0.6
	Scenario H1	61	45	0.3
	Scenario H2	64	45	0.3
	Scenario H3	66	45	0.3
	Scenario H4	67	46	0.3
	Scenario H5	68	46	0.4
R-5107 (Oscura)				
None	Baseline	57	47	0.5
	Scenario H1W	62	47	0.5
	Scenario H2W	65	47	0.5
	Scenario H3W	66	48	0.5
	Scenario H1	61	45	0.3
	Scenario H2	64	46	0.3
	Scenario H3	66	46	0.4
	Scenario H4	67	46	0.4
	Scenario H5	68	46	0.4
R-5107 (Lava E/W)				
Trinity Site, MacDonald Ranch	Baseline	61	52	1.5
	Scenario H1W	63	52	1.6
	Scenario H2W	64	52	1.6
	Scenario H3W	64	53	1.7
	Scenario H1	62	52	1.4
	Scenario H2	64	52	1.5
	Scenario H3	64	52	1.5
	Scenario H4	65	52	1.6
	Scenario H5	66	52	1.7
R-5107 (Mesa L/H)				
Salinas Pueblo Missions NM (Gran Quivira), Sevilleta NWR	Baseline	63	52	1.5
	Scenario H1W	63	52	1.6
	Scenario H2W	64	52	1.6
	Scenario H3W	64	52	1.6
	Scenario H1	63	52	1.4
	Scenario H2	64	52	1.4
	Scenario H3	64	52	1.4
	Scenario H4	65	52	1.5
	Scenario H5	65	52	1.5

Recreational Resource	*Scenario*	*DNL$_{mr}$*	*CDNL*	*Booms/Day*
R-5107 (Yonder, B/D)				
San Andres NWR, WHSA	Baseline	63	53	1.8
	Scenario H1W	63	53	1.8
	Scenario H2W	64	53	1.8
	Scenario H3W	65	53	1.9
	Scenario H1	63	51	1.3
	Scenario H2	64	51	1.3
	Scenario H3	65	51	1.3
	Scenario H4	65	52	1.4
	Scenario H5	66	52	1.4
R-5103 (Centennial)				
Otero Mesa- no public access	Baseline	54	47	0.5
	Scenario H1W	58	47	0.5
	Scenario H2W	60	47	0.5
	Scenario H3W	62	47	0.5
	Scenario H1	56	< 45	0.2
	Scenario H2	59	43	0.2
	Scenario H3	61	44	0.2
	Scenario H4	62	44	0.3
	Scenario H5	63	45	0.3
R-5103 (McGregor)				
Otero Mesa, Lincoln NF, Oliver Lee Memorial SP, Culp Canyon WSA	Baseline	56	45	0.3
	Scenario H1W	59	46	0.4
	Scenario H2W	60	47	0.5
	Scenario H3W	62	47	0.5
	Scenario H1	59	45	0.3
	Scenario H2	61	46	0.4
	Scenario H3	63	46	0.4
	Scenario H4	64	47	0.5
	Scenario H5	65	48	0.5
IR-133/142				
Capitan Mountain Wilderness, Salinas Pueblo Missions NM (Gran Quivira Unit, Abo, and Quarai Units), Valley of Fires SP, Lincoln NF	Baseline	55	N/A	N/A
	Scenario H1W	57	N/A	N/A
	Scenario H2W	59	N/A	N/A
	Scenario H3W	60	N/A	N/A
	Scenario H1	57	N/A	N/A
	Scenario H2	59	N/A	N/A
	Scenario H3	60	N/A	N/A
	Scenario H4	61	N/A	N/A
	Scenario H5	62	N/A	N/A
IR-134/195				
Brokeoff Mountains WSA, Culp Canyon WSA, Devil's Den Canyon WSA, Guadalupe Escarpment WSA, Lincoln NF	Baseline	49	N/A	N/A
	Scenario H1W	52	N/A	N/A
	Scenario H2W	53	N/A	N/A
	Scenario H3W	54	N/A	N/A
	Scenario H1	52	N/A	N/A
	Scenario H2	53	N/A	N/A
	Scenario H3	54	N/A	N/A
	Scenario H4	55	N/A	N/A
	Scenario H5	56	N/A	N/A

Recreational Resource	*Scenario*	*DNL_{mr}*	*CDNL*	*Booms/Day*
IR-192/194				
Brantley Reservoir, Culp Canyon WSA, Guadalupe Mountains NP, Lincoln NF, Carlsbad Caverns NP	Baseline	53	N/A	N/A
	Scenario H1W	56	N/A	N/A
	Scenario H2W	57	N/A	N/A
	Scenario H3W	58	N/A	N/A
	Scenario H1	56	N/A	N/A
	Scenario H2	57	N/A	N/A
	Scenario H3	58	N/A	N/A
	Scenario H4	59	N/A	N/A
	Scenario H5	60	N/A	N/A
R-5107B				
WHSA	Baseline	63	53	1.8
	Scenario H1W	63	53	1.8
	Scenario H2W	64	53	1.8
	Scenario H3W	65	53	1.9
	Scenario H1	63	51	1.3
	Scenario H2	64	51	1.3
	Scenario H3	65	51	1.3
	Scenario H4	65	52	1.4
	Scenario H5	66	52	1.4
R-5107B/D				
WHSA	Baseline	63	53	1.8
	Scenario H1W	63	53	1.8
	Scenario H2W	64	53	1.8
	Scenario H3W	65	53	1.9
	Scenario H1	63	51	1.3
	Scenario H2	64	51	1.3
	Scenario H3	65	51	1.3
	Scenario H4	65	52	1.4
	Scenario H5	66	52	1.4

[1] Noise levels beneath MOAs listed also include noise generated by aircraft operating in overlying ATCAAs; airspace units in which supersonic noise levels are “N/A” are not authorized for supersonic flights.

Table HO 3.10–10. Daily Sortie-Operations by Airspace and Associated Recreational Use Areas[1]

Airspace[3]	*Recreational Resource*	*Baseline Conditions*	*Daily Sortie-Operations*[2] Scenario HW1/H1 (24 Aircraft)	Scenario HW2/H2 (48 Aircraft)	Scenario HW3/H3 (72 Aircraft)	Scenario H4 (96 Aircraft)	Scenario H5 (120 Aircraft)
Beak MOAs/ATCAA	Capitan Mountain Wilderness, White Mountain Wilderness, Ski Apache, Little Black Peak Carrizozo Lava Flow WSA, Valley of Fires SP, Cibola NF	24	28/19	32/26	36/20	30	35
Pecos MOA/ATCAA	Sumner Lake SP	7	8/7	9/7	10/7	7	7
Cato MOA/ATCAA	Withington Wilderness	2	2/2	3/2	3/2	2	2
Talon MOA/ATCAA	Avalon Reservoir, Brantley Reservoir and SP, Living Desert SP	10	13/8	16/12	18/13	15	17
R-5107 (Lava E/W)	Trinity Site, MacDonald Ranch	25	29/27	34/34	38/36	40	47
R-5107 (Mesa L/H)	Salinas Pueblo Missions NM (Gran Quivira Unit), Sevilleta NWR	25	28/24	30/27	32/28	30	34
R-5107 (Yonder, B/D)	San Andres NWR, WHSA	30	32/23	35/23	38/28	31	38
R-5107B[4]	WHSA	30	32/23	35/23	38/28	31	38
R-5107B/D[4]	WHSA	30	32/23	35/23	38/28	31	38
R-5103 (Centennial)	Otero Mesa	25	27/21	29/23	31/23	24	29
R-5103 (McGregor)	Otero Mesa, Lincoln NF, Oliver Lee Memorial SP	84	88/86	91/91	94/92	95	100
IR-133/142	Capitan Mountain Wilderness, Salinas Pueblo Missions NM (Gran Quivira, Abo, and Quarai Units), Valley of Fires SP	3	3/3	3/3	4/3	4	4
IR-134/195	Brokeoff Mountains WSA, Lincoln NF, Carlsbad Caverns NP	1	1/<1	1/<1	1/1	1	1
IR-192/194	Brantley Reservoir, Lincoln NF, Guadalupe Mountains NP	2	2/2	2/2	3/2	3	3

1 Does not include list of WSAs.
2 X/Y represents noise level with and without the F-16 mission.
3 R-5107 Red Rio and Oscura not included since they do not overlie any publicly accessible recreational areas.
4 Sorties and noise levels in R-5107 B and B/D are conservative (high) estimates for F-35A operations transiting between the Yonder and Lava East/West training ranges.

The vast majority of noise from use of ranges for projected F-35A munitions training was assumed to occur within the ranges themselves and would have negligible effects on SULMAs and other land uses outside the ranges.

Average noise levels would increase moderately in MOAs (by up to 6 dB DNL_{mr}), mostly under Scenarios H1W, H2W, and H3W. Beak MOA would experience up to a 6 dB DNL increase and a 40 to 50 percent increase in daily operations. These changes would be noticeable for underlying portions of Capitan Mountain Wilderness, White Mountain Wilderness, Ski Apache, Lincoln NF, and Cibola NF, although levels of up to 51 dB DNL_{mr} for the most intensive scenario (H5) for Beak MOA and overlying ATCAA would remain relatively low. Talon MOA would experience noticeable increases of up to 4 dB DNL_{mr} under Scenario H3W (affecting Avalon Reservoir, Brantley Reservoir and State Park, Living Desert State Park, and portions of Lincoln NF).

F-35A training may cause a slight increase in night training over areas where this already occurs. Night operations could be incompatible with summertime outdoor camping and vacationing in that they could interfere with the quality of a recreational experience for some persons. The areas with most concentrated camping (mostly during the summer) where these effects may be noticed are state parks with developed campsites underlying Talon MOA, including Avalon Reservoir, Brantley Reservoir and State Park, Living Desert State Park, and Oliver Lee State Park under R-5103. Night overflights may also annoy persons in wilderness areas such as Capitan Mountain Wilderness and White Mountain Wilderness (under Beak MOA). Given the dispersion of aircraft in MOAs, the chance of a direct night overflight at any given location would be very low under any scenario.

The bombing ranges on WSMR and Centennial on McGregor Range would experience substantial increases in noise up to 9 and 11 dB DNL. Since there are no recreational activities at these locations, there would be no direct impact on recreation. Surrounding restricted airspace on WSMR would experience between 2 and 5 dB increases for the most intensive scenarios. These areas are currently affected by levels greater than 60 dB. Recreation on WSMR is very limited and occurs only at regularly scheduled times during the year, and generally, on weekends, when F-35A training would not occur; therefore, the potential for impacts is minimal. Only a minor 2 dB increase could affect Salinas Pueblo Missions NM (Gran Quivira unit) and an extremely small portion of the Sevilleta NWR under Scenarios H4 and H5. Up to 3 dB DNL_{mr} increases may affect WHSA, primarily over the western areas under the Yonder airspace. This area is characterized by a natural quite soundscape but has few visitors.

The greatest impact could occur for recreation on the Otero Mesa of McGregor Range and the Sacramento Mountain foothills at the north end of R-5103. In this area, changes would range from a 3 dB increase under Scenarios H1 and H1W up to a 9 dB increase under Scenario H5, for a maximum of 65 dB DNL_{mr}. These changes range from noticeable to substantial for underlying portions of Lincoln National Forest, Oliver Lee State Park, and general public use of Otero Mesa (a popular and valued natural area). Since training generally does not occur on weekends, when most recreational uses take place, this somewhat offsets the potential for impacts on persons using this area for recreation.

An increase in sorties on the IR routes would occur. There may be one to three on a route each day currently, and this could increase by about one additional each day. Because these occur

over a relatively defined route, each route could experience up to 7 dB DNL_{mr} increases in areas underlying the route. This would affect a portion of several recreational resources (see Table HO 3.10–9), including Salinas Pueblo Missions National Monument (Gran Quivira, Quarai, and Abo units). Increased noise has the potential to impact visitor experience and the setting and feeling of the National Park Service areas. Persons on the ground may be startled and annoyed by high-speed and often low-level overflights; however, these events would be very infrequent over any given location on the ground.

Supersonic noise would tend to decrease with the F-35A beddown, with the exception of two MOAs, particularly under Scenarios H1W through H3W. An increase of 1 dB CDNL (from 49 to 50) could result inside the Beak MOA and ATCAA, with a slight increase in the frequency of sonic booms from about 1.4 up to 1.8 per day. Several underlying recreational sites and areas would experience this slight change, including Capitan Mountain Wilderness, White Mountain Wilderness, Ski Apache, Lincoln National Forest, Cibola National Forest, Little Black Peak Carrizozo Lava Flow Wilderness Study Area, and Valley of Fires State Park. A similar 1 dB CDNL increase would affect Pecos MOA and the underlying Sumner Lake State Park, although very little change in frequency would result. Supersonic noise would decrease in restricted airspace over WSMR and Centennial Range, but would increase slightly in R-5103 over McGregor Range. Events would remain relatively infrequent, increasing from about 1 or 2 per week to about 2 or 3 per week for the most intensive scenarios. Supersonic flights do not occur on the IR routes so there would be no effects on underlying recreational resources.

The number of daily operations (shown in Table HO 3.10–10) would increase substantially under Scenarios H1W, H2W, H3W, H4, and H5. Under Scenarios H1W through H3W, both Talon and Beak MOAs would experience the greatest increases. Under Scenarios H1 through H5, the MTRs would experience about an 80 percent increase (under Scenario H5), although the actual numbers of daily operations would remain low under all scenarios (at less than 4 per day). Uses of the bombing ranges on WSMR within R-5107 (Red Rio and Oscura) would increase substantially under Scenarios H4 and H5; however, there are no recreational use areas in these ranges.

The potential for annoyance from single overflights (see Chapter 3, Sections 3.2 and 3.8, for more information) would increase proportionately to the operational increases. This potential impact is somewhat moderated by the very limited public access on WSMR and relatively low public use of McGregor Range. However, the Otero Mesa grasslands have gained popularity and public support as a valuable natural resource. The impact of these overflights and the potential for exposure to loud single events is reduced considering that training would not occur on weekends. Hunting is an exception, as hunters may be active all week during hunting seasons, although special hunts are generally scheduled on weekends. Typically, hunts are organized by the NMDGF and coordinated with military users to avoid overlap between public recreational events and military uses as much as possible. Because of this, noise impacts on recreation should remain relatively low on McGregor Range. Single low-level overflights would about double on the Instrument Routes, but would remain very infrequent (the most, about four per day, are projected for IR-133/142 under Scenario H5). This could annoy some visitors to the Salinas Pueblo Missions National Monument (Gran Quivira, Abo, and Quarai units), Valley of Fires State Park, and the Capitan Mountain Wilderness, but would likely not change visitation levels.

Auxiliary Airfields

Biggs AAF. Use of Biggs AAF for F-35A operations would not increase noise at off-base recreational sites to levels greater than 65 dB DNL. There may be a slight increase in noise levels for the recreational areas located in the new brigade areas on the east side of the Biggs AAF, but the levels would not be incompatible with the designated uses.

EPIA. Eight recreational sites would experience increased noise from proposed use of EPIA for F-35A training operations. Table HO 3.10–11 shows there would be a minimal progressive increase in noise at recreational sites surrounding the airfields. Normandy Park would experience levels above 65 dB DNL under Scenarios H4 and H5. Noise levels at the Chelsea outdoor swimming pool would not exceed 65 dB DNL under any scenario. Projected levels would not prevent recreational use at these locations; the quality of recreation may decline as noise exposure increases. Butterfield Trail Golf Course is outside the area that would be affected by 65 dB DNL noise levels under all F-35A beddown scenarios.

Table HO 3.10–11. Noise Effects on Recreational Amenities Around Biggs AAF and EPIA

Recreational Amenity	*Average Noise Level (dB DNL)*					
	Baseline Conditions	**Scenario H1 (24 Aircraft)**	**Scenario H2 (48 Aircraft)**	**Scenario H3 (72 Aircraft)**	**Scenario H4 (96 Aircraft)**	**Scenario H5 (120 Aircraft)**
Normandy Park	< 65	< 65	< 65	< 65	< 65	65–70
Mesa Terrace Park	< 65	< 65	< 65	< 65	< 65	< 65
Loretto-Lincoln Park	< 65	< 65	< 65	< 65	< 65	< 65
Lincoln Park	< 65	< 65	< 65	< 65	< 65	< 65
Washington Park	< 65	< 65	< 65	< 65	< 65	< 65
Chelsea (outdoor pool)	< 65	< 65	< 65	< 65	< 65	< 65

RIAC. There are no outdoor recreational amenities near the airfield that would be affected by noise from projected use of the RIAC for F-35A training operations under any scenario. Sunset Elementary School is not directly under the flight paths for the runways and would not experience noise levels above 65 dB DNL under any scenario.

HO 3.11 Socioeconomics

HO 3.11.1 Base

The ROI for socioeconomics for the Holloman AFB alternative is defined as Otero County, New Mexico, and the city of Alamogordo. Potential socioeconomic consequences from the F-35A training activities would be concentrated within the county and, more particularly, within the city. The definition of socioeconomic resources and methodology for analysis are described in Chapter 3, Section 3.9.

HO 3.11.1.1 Base Affected Environment

Population. In 2010, Otero County was ranked as the ninth most populated county in New Mexico, with a total of 63,797 persons, and accounted for approximately 3.1 percent of the total population of New Mexico (see Table HO 3.11–1) (USCB 2010a).

In 2010, Alamogordo accounted for nearly half of the county's population (47.7 percent), followed by Tularosa (4.5 percent) and Cloudcroft (1.1 percent). Alamogordo is the county seat and the nearest city to Holloman AFB. Potential socioeconomic impacts would likely be focused within Alamogordo. Information is presented for Otero County, the state of New Mexico, and the city of Alamogordo where recent data are available.

Table HO 3.11–1. Population Growth, 2000–2010

Location	*Census 2000*	*Census 2010*	*Average Annual Percentage Change 2000–2010*
Otero County	62,299	63,797	0.2
Alamogordo	35,582	30,403	(1.6)
New Mexico	1,819,041	2,059,179	1.2

Note: (Number) denotes a negative number.
Source: USCB 2000a, 2010a.

As of 2009, there were approximately 4,241 active-duty military personnel and 1,613 civilian personnel assigned to Holloman AFB (Holloman AFB 2009b). Additional personnel are expected to transfer to Holloman AFB as the F-16 training mission beddown and the new UAS mission are completed. Holloman AFB's baseline population in this EIS includes the full complement of F-16 and UAS personnel, which totals 6,732.

Housing. As of 2010, there were an estimated 30,992 housing units in Otero County, an estimated 24,464 of which (nearly 80 percent of the total supply of housing) were occupied (USCB 2010a). In the city of Alamogordo, nearly 91 percent of the 14,052 housing units were occupied in 2010.

During scoping, several commenters expressed concern that the noise generated by the F-35A training at Holloman AFB could adversely affect property values. In the state of New Mexico, property values are determined based on the assessed market value of the property. The market value is calculated as the amount a buyer would be willing to pay for the property at a given moment in time. Two similar properties could have different market values based on factors such as proximity to schools and shopping; quality of neighboring properties; and neighborhood amenities, such as parks.

The recent recession and decline in housing values has had an impact on the real estate market and housing values. The recession has resulted in falling sales prices. These lower sales prices would be reflected in the comparable sales evaluation of the market value of properties and result would in lower property values.

Schools. There are three school districts serving Otero County: the Alamogordo Public School District, the Tularosa Municipal School District (MSD), and the Cloudcroft MSD. During the 2009–2010 school year, there were 7,506 students in Otero County. The Alamogordo Public School District serves the largest population in the county; it therefore, had the largest number of students, with 6,124 students. Tularosa MSD had 946 students, and Cloudcroft MSD had 436 students (see Table HO 3.11–2) (NMPED 2010). There are two Alamogordo public schools located on Holloman AFB, including Holloman Elementary and Holloman Middle (Holloman AFB 2010b).

Table HO 3.11–2. Number of Students, 2009–2010 School Year

Location	*Kindergarten through Grade 3*	*Grades 4–8*	*Grades 9–12*	*Total*
Alamogordo Public School District	2,013	2,235	1,875	6,124
Tularosa Municipal School District	280	354	312	946
Cloudcroft Municipal School District	116	159	161	436
Otero County	2,409	2,748	2,348	7,506

Source: NMPED 2010.

Capacity is determined based on individual schools. As of the 2008–2009 school year, the student-to-teacher ratio for the Alamogordo Public School District was 14.29; Cloudcroft MSD was 9.08; and Tularosa MSD was 11.22. These student-to-teacher ratios are lower than the maximum class loads dictated by *New Mexico Administrative Code* (NMAC 2009), which restricts kindergarten class size to 20 students; Grades 1 through 3, to 22 students; Grades 4 through 6, to 24 students; and Grades 7 through 12, to 27 students (NMAC 2009). The average New Mexico maximum class size across all grades is 23 students per class.

Total Employment. Total employment in Otero County in 2008 was 28,216 jobs. Between 2006 and 2008, employment grew at an average annual rate of less than 0.5 percent. Government and government enterprises industry has a total employment of 10,257 jobs; followed by retail trade, with 3,137 jobs; and health care and social assistance, with 2,650 jobs (BEA 2010).

Holloman AFB serves as a major economic force in Otero County, particularly in Alamogordo. In 2008, Holloman AFB employed nearly 9,914 personnel, including active-duty military personnel and civilians, with a gross payroll totaling $247,514,655 (Holloman AFB 2008b). An additional 1,654 indirect jobs were created from base-related activities (Holloman AFB 2008b).

Public Services. Public services are provided by the county and city governments in Otero County and Alamogordo, as well as other government agencies. Changes in population would affect the demand for these services, as well as the ability to fund them.

Tax revenues collected by the State of New Mexico in FY2008 totaled over $6.0 billion, including a combination of property taxes, sales taxes, and income taxes (NMDTR 2009). In 2010, Otero County estimated tax revenues to be $26.3 million (Otero County 2010). In 2009, the City of Alamogordo collected over $14.78 million in tax revenues (Alamogordo 2010a).

Table HO 3.11–3 shows the Otero County law enforcement personnel as of fall 2004. The City of Alamogordo Department of Public Safety, established in 1967, provides police and fire protection services for the community of Alamogordo. Officers of the Department of Public Safety serve dual roles as police officers and firefighters. There are 70 officers with these dual roles and 12 officers that serve exclusively as fire equipment operators. There are seven fire stations throughout the city of Alamogordo (Alamogordo 2007a).

Table HO 3.11–3. Total Otero County Law Enforcement Personnel, 2004

Department	*Number of Personnel*
U.S. Border Patrol (agents)	53
New Mexico State Police (police and troopers)	20
Otero County Sheriff Department (sheriff and deputies)	26
Alamogordo Department of Public Safety[1]	82
Tularosa Police Department[1]	8
Cloudcroft Police Department[1]	3
Alamogordo Animal Control	5

[1] Full-time police officers.
Source: ADPS 2010; Otero County 2005.

In addition, fire and emergency medical services are provided to residents of Otero County through the Otero County Fire Fighters Association (OCFFA), which includes 21 volunteer fire and emergency medical services departments, as well as Federal, state, municipal, and tribal entities (Cloudcroft 2010).

As the largest city in Otero County, the city of Alamogordo serves as a regional center for medical care. The Gerald Champion Regional Medical Center (GCRMC), located in Alamogordo, is the only hospital in the county. There are 640 employees at GCRMC (GCRMC 2009) and 165 licensed medical professionals with privileges at GCRMC who have varying specializations, including primary care, pediatrics, surgery, pharmacy, and nursing (OCEDC 2010). This hospital is a shared facility with Holloman AFB in which military physicians have full admission services for their patients and the patients' dependents. There are also 15 dentists in Otero County and four nursing care centers (OCEDC 2010).

HO 3.11.1.2 Base Environmental Consequences

The socioeconomic consequences of Scenarios H1W, H2W, H3W, H1, H2, H3, H4, and H5 are presented below.

Scenarios H1W, H2W, and H3W

Employment and Population. Potential socioeconomic impacts from construction expenditures and the change in personnel due to F-35A Scenarios H1W, H2W, and H3W are summarized in Table HO 3.11–4. The direct jobs listed under construction would be new construction-related jobs. The indirect and induced jobs created by the construction expenditures would be spread among a variety of industries supporting construction, such as supplies and materials, food services, and retail services. The construction jobs under each scenario would constitute between 12.2 and 16.8 percent of the total employment in Otero County. The level of construction activity may result in migration into Otero County from surrounding communities and counties, such as Doña Ana County or El Paso County, as construction workers may choose to move to Otero County to get the new jobs. Construction expenditures and the jobs created would be temporary and would result in 2-3 years of stimulation to the local construction industry.

Under each F-35A aircraft scenario, the population change from the personnel and their dependents would constitute an increase ranging from 7.4 to 18.4 percent in the city of Alamogordo. The incoming F-35A population is expected to move into the area as the F-35A aircraft arrive. The average annual population increase resulting from the F-35A personnel would range from 1.8 to 4.3 percent per year.

In 2010, Otero County had an unemployment rate of 7.4 percent, with a total of 1,962 unemployed persons (BLS 2011). The degree of induced employment growth is such that positions could be filled by unemployed persons currently in the county or by spouses of the incoming personnel. When combined with the indirect and induced employment generated by the increase in construction expenditures, the unemployment rate would decrease, encouraging additional migration into Otero County. Particularly under Scenario H3W, the indirect and induced employment from the construction expenditures and the personnel change have the potential to reduce the unemployment rate to as low as 3.9 percent, all other variables being equal.

Table HO 3.11–4. Potential Socioeconomic Impacts, Scenarios H1W, H2W, and H3W

	Scenario H1W (24 Aircraft)	*Scenario H2W (48 Aircraft)*	*Scenario H3W (72 Aircraft)*
Construction (jobs)[1]			
Direct	2,999	3,560	4,122
Indirect	227	269	312
Induced	221	262	303
Total	**3,447**	**4,091**	**4,737**
Population (persons)[2]			
Existing Conditions[3]	30,403	30,403	30,403
Direct	2,260	3,922	5,588
Total	**32,663**	**34,325**	**35,991**
Percentage Change	*7.4*	*12.9*	*18.4*
Employment (jobs)[1]			
Existing Conditions[4]	28,216	28,216	28,216
Direct	727	1,267	1,808
Induced	123	215	306
Total	**29,066**	**29,698**	**30,330**
Percentage Change	*3.0*	*5.3*	*7.5*
Housing (units)[2]			
Existing Conditions[3]	16,307	16,307	16,307
Direct	727	1,267	1,808
Total	**17,034**	**17,574**	**18,115**
Percentage Change	*4.5*	*7.8*	*11.1*
Students (persons)[2]			
Existing Conditions[5]	6,124	6,124	6,124
Direct	709	1,235	1,763
Total	**6,833**	**7,359**	**7,887**
Percentage Change	*11.6*	*20.2*	*28.8*
Student-Teacher Ratio[5]	23.25	23.25	23.25
Potential Number of New Teachers	30	53	76
Tax Revenues (million dollars)[1]			
State and Local Taxes	4.15	7.23	10.32
Federal Taxes	10.51	18.32	26.15
Total	**14.66**	**25.56**	**36.47**

	Scenario H1W (24 Aircraft)	*Scenario H2W (48 Aircraft)*	*Scenario H3W (72 Aircraft)*
Law Enforcement and Firefighters (persons)[2]			
Existing Conditions[6]	82	82	82
Direct	3	5	7
Total	**85**	**87**	**89**
Percentage Change	*3.7*	*6.1*	*8.5*
Medical Professionals (persons)[1]			
Existing Conditions[7]	820	820	820
Direct	29	50	72
Total	**849**	**870**	**892**
Percentage Change	*3.5*	*6.1*	*8.8*

1 Otero County ROI.
2 City of Alamogordo ROI.
3 Source: USCB 2010a.
4 Source: BEA 2010.
5 Source: NMPED 2010.
6 Source: Otero County 2005.
7 Source: GCRMC 2009; OCEDC 2010.

Housing. Assuming one household for each new member of Holloman AFB personnel, the demand for housing would increase, as shown in Table HO 3.11–4. New F-35A personnel, including the F-35A students, would be dependent on the community for housing assuming that the on-base housing for Holloman AFB is fully occupied. There were approximately 1,264 vacant housing units in the city of Alamogordo in 2010 (USCB 2010a). Due to the increase in demand for housing units by F-35A personnel, the housing market in Alamogordo may not be adequate to meet the needs of the incoming personnel. The Air Force has identified the need to construct up to 500 new homes on base, which would help meet a portion of the F-35A personnel housing demand. However, as the personnel move into the area, the housing market would tighten and may result in a housing shortage in the short term. Potential increases in population, due to migration into the area from indirect and induced employment, created by construction expenditures and personnel changes would exacerbate the situation. In the long term, housing developers would likely begin to construct new homes to meet the demand.

Schools. The number of school-aged dependents between the ages of 4 and 18 was estimated and listed as students in Table HO 3.11–4. The average maximum class size for New Mexico schools is 23 students per class, as dictated by *New Mexico Administrative Code* (NMAC 2009). If all of the current classes in the school districts in the area are at their maximum class sizes, the addition of the students of F-35A personnel would result in the need for additional teachers, as listed in Table HO 3.11–4. As discussed in Section HO 3.11.1.1, the average class sizes in the ROI school districts are below the state-mandated maximum class sizes, indicating available capacity. In addition, the incoming personnel and created jobs would increase the amount of state and local taxes, which the school districts depend on for funding. Therefore, it is anticipated that the schools would have the capacity to accept the incoming students without impacting school resources.

Public Services. Provision of public services is dependent on the population needing the services and the ability of the state and local communities to provide those services, as supported by tax revenues. Using the Impact Analysis for Planning (IMPLAN) economic

forecasting model, the amount of Federal, state, and local tax revenues generated by the increase in population and employment was estimated and is presented in Table HO 3.11–4.

The number of additional law enforcement officers, firefighters, and medical professionals has been estimated by determining the existing proportion of these services to the current population. Because of the dual role of law enforcement officers and firefighters in the city of Alamogordo, the estimated population increase under each F-35A aircraft scenario would potentially support the addition of between three and seven law enforcement officers/firefighters. The number of law enforcement officers/firefighters hired by the state and local authorities would be dependent on the level of tax revenues collected and the level of service provided by the existing police officers/firefighters. The number of medical professionals supporting the city of Alamogordo and Otero County is estimated to increase by between 29 and 72 professionals under the scenarios. It is not anticipated that the population change would impact the provision of public services.

Noise and Property Values. Airfield flight operations of the F-35A at Holloman AFB are not expected to change the number of residents affected by noise levels greater than 65 dB DNL under Scenarios H1W through H3W, compared with the baseline flight operations (see Table HO 3.11–5). Therefore, no impacts on off-base residents or property values are anticipated under Scenarios H1W through H3W.

Table HO 3.11–5. Estimated Residents Affected by Noise Levels Greater Than 65 dB DNL, Baseline Conditions and Scenarios H1W, H2W, and H3W

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario H1W (24 Aircraft)*	*Scenario H2W (48 Aircraft)*	*Scenario H3W (72 Aircraft)*
Total ≥ 65	**49**	**48**	**48**	**48**
65–69	22	21	21	21
70–74	27	27	27	27
75–79	–	–	–	–
80–84	–	–	–	–
≥ 85	–	–	–	–

Key: dB=decibel; DNL=day–night average sound level.
Source: USCB 2010a, as analyzed using GIS.

Scenarios H1, H2, H3, H4, and H5

Employment and Population. Potential socioeconomic impacts from construction expenditures and the change in personnel due to F-35A Scenarios H1, H2, H3, H4, and H5 are summarized in Table HO 3.11–6. Construction jobs under each scenario would constitute between 2.5 and 15.6 percent of the total employment in Otero County. The level of construction activity may result in a migration into Otero County from surrounding communities and counties, such as Doña Ana County or El Paso County, as construction workers move to Otero County to get the new jobs. Construction expenditures and the jobs created would be temporary and would result in 2–3 years of stimulation to the local construction industry. No long-term impacts from the construction activity or the potential in-migration of workers would occur.

The population change from the personnel and their dependents under Scenarios H1 through H5 would range from a 3.8 percent decrease in total population up to an 18.1 percent increase.

The average annual change resulting from the F-35A personnel would range from a 1.0 percent decrease to a 4.2 percent increase per year.

The degree of induced employment growth is such that the positions could be filled by unemployed persons currently in the county or by spouses of the incoming personnel. When combined with the indirect and induced employment generated by the increase in construction expenditures, the unemployment rate would decrease, encouraging additional migration into Otero County. Particularly under Scenario H5, the indirect and induced employment from the construction expenditures and the personnel change have the potential to reduce the unemployment rate to as low as 4.1 percent, all other variables being equal.

Housing. The housing market in Alamogordo may not be adequate to meet the needs of the incoming personnel due to the increase in the demand for housing units by F-35A personnel. The Air Force has identified the need to construct up to 375 new homes on base, which would help meet a portion of the F-35A personnel housing demand. However, as the personnel move into the area, the housing market would tighten and may result in a housing shortage in the short term. Potential increases in population, due to migration into the area from indirect and induced employment, created by construction expenditures and personnel changes would exacerbate the situation. In the long term, housing developers would likely begin to construct new homes to meet the demand.

Table HO 3.11–6. Potential Socioeconomic Impacts, Scenarios H1 through H5

	Scenario H1 (24 Aircraft)	*Scenario H2 (48 Aircraft)*	*Scenario H3 (72 Aircraft)*	*Scenario H4 (96 Aircraft)*	*Scenario H5 (120 Aircraft)*
Construction (jobs)[1]					
Direct	625	901	2,045	2,451	3,841
Indirect	47	68	155	185	291
Induced	46	66	151	180	283
Total	**718**	**1,036**	**2,351**	**2,816**	**4,415**
Population (persons)[2]					
Existing Conditions[3]	30,403	30,403	30,403	30,403	30,403
Direct	(1,157)	505	2,170	3,832	5,494
Total	**29,246**	**30,908**	**32,573**	**34,235**	**35,897**
Percentage Change	*(3.8)*	*1.7*	*7.1*	*12.6*	*18.1*
Employment (jobs)[1]					
Existing Conditions[4]	28,216	28,216	28,216	28,216	28,216
Direct	(341)	199	740	1,280	1,820
Induced	(58)	34	125	217	308
Total	**27,817**	**28,449**	**29,081**	**29,713**	**30,344**
Percentage Change	*(1.4)*	*0.8*	*3.1*	*5.3*	*7.5*
Housing (units)[2]					
Existing Conditions[3]	16,307	16,307	16,307	16,307	16,307
Direct	(341)	199	740	1,280	1,820
Total	**15,966**	**16,506**	**17,047**	**17,587**	**18,127**
Percentage Change	*(2.1)*	*1.2*	*4.5*	*7.8*	*11.2*
Students (persons)[2]					
Existing Conditions[5]	6,124	6,124	6,124	6,124	6,124
Direct	(332)	194	722	1,248	1,775
Total	**5,792**	**6,318**	**6,846**	**7,372**	**7,899**
Percentage Change	*(5.4)*	*3.2*	*11.8*	*20.4*	*29.0*
Student–Teacher Ratio	23.25	23.25	23.25	23.25	23.25
Potential Number of New Teachers	–	8	31	54	76

	Scenario H1 (24 Aircraft)	*Scenario H2 (48 Aircraft)*	*Scenario H3 (72 Aircraft)*	*Scenario H4 (96 Aircraft)*	*Scenario H5 (120 Aircraft)*
Tax Revenues (million dollars)[1]					
State and Local Taxes	(1.95)	1.14	4.22	7.31	10.39
Federal Taxes	(4.93)	2.88	10.70	18.51	26.32
Total	**(6.88)**	**4.01**	**14.93**	**25.82**	**36.71**
Law Enforcement Officers/Firefighters (persons)[2]					
Existing Conditions[6]	82	82	82	82	82
Direct	–	1	3	5	7
Total	**82**	**83**	**85**	**87**	**89**
Percentage Change	*0.0*	*1.2*	*3.7*	*6.1*	*8.5*
Medical Professionals (persons)[1]					
Existing Conditions[7]	820	820	820	820	820
Direct	–	6	28	49	71
Total	**820**	**826**	**848**	**869**	**891**
Percentage Change	*0.0*	*0.8*	*3.4*	*6.0*	*8.6*

[1] Otero County ROI.
[2] City of Alamogordo ROI.
[3] Source: USCB 2010a.
[4] Source: BEA 2010.
[5] Source: NMPED 2010.
[6] Source: Otero County 2005.
[7] Source: GCRMC 2009; OCEDC 2010.
Note: (Number) denotes a negative number.

Schools. As discussed in Section HO 3.11.1.1, the average class sizes in the ROI school districts are below the state-mandated maximum class sizes, indicating available capacity. In addition, the incoming personnel and created jobs would increase the amount of state and local taxes, which the school districts depend on for funding. Therefore, it is anticipated that the schools would have the capacity to accept the incoming students without impacting school resources.

Public Services. The amount of Federal, state, and local tax revenues generated by the increase in population and employment was estimated and is presented in Table HO 3.11–6.

Because of the dual role of law enforcement officers and firefighters in the city of Alamogordo, the estimated population increase under each scenario would potentially support the addition of up to seven law enforcement officers/firefighters. The number of law enforcement officers/firefighters hired by the state and local authorities would be dependent on the level of tax revenues collected and the level of service provided by the existing police officers/firefighters. The number of medical professionals supporting the city of Alamogordo and Otero County is estimated to increase up to 71 professionals under the scenarios. It is not anticipated that the population change would impact the provision of public services.

Noise. Airfield flight operations of the F-35A at Holloman AFB are not expected to substantially change the number of residents affected by noise levels greater than 65 dB DNL under Scenarios H1 through H5, compared with the baseline flight operations (see Table HO 3.11–7). Under these scenarios, the number of residents affected by noise levels greater than 65 dB DNL would decrease compared with the number of residents affected under the baseline conditions. Therefore, no impacts on off-base residents or property values are anticipated under Scenarios H1 through H5.

Table HO 3.11–7. Estimated Residents Affected by Noise Levels Greater Than 65 dB DNL, Baseline Conditions and Scenarios H1, H2, H3, H4, and H5

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario H1 (24 Aircraft)*	*Scenario H2 (48 Aircraft)*	*Scenario H3 (72 Aircraft)*	*Scenario H4 (96 Aircraft)*	*Scenario H5 (120 Aircraft)*
Total ≥ 65	**49**	**44**	**44**	**44**	**44**	**44**
65–69	22	22	22	21	21	20
70–74	27	22	22	23	23	24
75–79	–	–	–	–	–	–
80–84	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–

Key: dB=decibels; DNL=day–night average sound level.
Source: USCB 2010a, as analyzed using GIS.

HO 3.11.2 Airspace

The ROI for socioeconomic resources under the airspace to be used by the F-35A includes the counties or the portions of the counties under the primary use airspace. Primary use airspace has been defined as airspace that would be used by the F-35A on a daily basis. Occasional use airspace would be used by the F-35A when the primary use airspace is unavailable. The occasional use airspace would be used infrequently; therefore, potential impacts on the areas underlying the occasional use airspace would be negligible. The definition of socioeconomic resources and methodology for analysis are described in Chapter 3, Section 3.9.

HO 3.11.2.1 Airspace Affected Environment

The F-35A would utilize the same airspace used by the F-16 training mission at Holloman AFB. The airspace to be used under each scenario is discussed in Sections HO 2.0 and HO 3.1.

Six low-level MTRs would be used by the F-35A as primary use airspace, as shown in Tables HO 2.2–3 and HO 2.2–4. These airspace units represent corridors of airspace that overlie portions of rural counties. During public hearings and in written responses to comments, residents of these areas expressed annoyance with existing aircraft overflights on the MTRs and also expressed objection to possibly being overflown by training F-35A if Holloman AFB were selected to base the aircraft.

Because no new airspace or airspace modifications are proposed for the F-35A beddown, no additional population would be affected by training overflights. The area under the airspace is not densely populated. GIS and 2010 census data were used to estimate the population under the primary use airspace (see Table HO 3.11–8).

In addition to use of airspace and the ranges at WSMR and Fort Bliss, the F-35A aircraft at Holloman AFB would use Biggs AAF at Fort Bliss, RIAC, and EPIA as auxiliary airfields for certain training events. No construction or personnel changes at either airfield are proposed as part of this training. F-35A aircraft would simply use the airfield assets by performing practice approaches to the runways at the three auxiliary airfields. Therefore, socioeconomic analysis focuses on the potential impacts on population and housing as a result of noise generated by the F-35A training events at Biggs AAF, RIAC, and EPIA.

Biggs AAF and EPIA are both located within the city of El Paso in El Paso County, Texas. The potentially affected region for both of these proposed auxiliary airfields is the area immediately surrounding the airfields, which includes portions of the city of El Paso. The 2010 population of the city of El Paso was 649,121 persons, an increase from the 2000 population of 563,662 persons (USCB 2000a, 2010a). In 2010, there were 227,605 housing units in the city of El Paso, an increase of approximately 33,825 housing units since 2000 (USCB 2000b, 2010a). Noise levels above 65 dB DNL currently affect an estimated 638 persons in the vicinity of Biggs AAF and an estimated 1,295 persons in the vicinity of EPIA.

RIAC is located south of the city of Roswell in Chaves County, New Mexico. The potentially affected region is within the vicinity of the airfield and potentially extends into the city of Roswell. The 2010 population of the city of Roswell was 48,366 persons, an increase from the 2000 population of 45,293 (USCB 2000a, 2010a). In 2010, there were 19,743 housing units in the city of Roswell, a slight increase of 457 housing units since 2000 (USCB 2000b, 2010a). Noise levels between 65 and 74 dB DNL currently affect an estimated 61 persons in the vicinity of RIAC.

HO 3.11.2.2 Airspace Environmental Consequences

F-35A aircraft using the airspace units listed in Table HO 3.11–8 would be governed by the same regulations and guidelines as the aircraft currently using the airspace. Supersonic operations would only take place above the minimum altitudes designated for each airspace unit. Flight safety guidelines are discussed in Section HO 3.4. The population under the primary use airspace units is currently exposed to military aircraft overflights and supersonic operations. The population density under each airspace unit is relatively low, ranging from less than 1 person per square mile up to 17 persons per square mile, depending on the airspace unit. The average population density in the state of New Mexico is 15 persons per square mile.

Noise levels in the airspace are discussed in more detail in Section HO 3.2. Table HO 3.2–4 presents the primary use airspace units under each aircraft scenario and the resulting change in noise levels from projected F-35A flight operations. Residents under the Beak, Talon, Cato, and Pecos MOAs and overlying ATCAAs, as well as residents under IR-133/142, IR-134/195, and IR-192/194, would likely notice the increase in noise levels under some basing scenarios. Those residents could be annoyed by additional overflight and associated noise. No changes would be made to the avoidance procedures and flight restrictions currently used by Holloman AFB. The noise level increases from baseline conditions under these airspace units are not of the levels expected to adversely affect economic decisions, property values, or other socioeconomic resources in the areas underlying the airspace. In the R-5107 and R-5103 airspace units, residents are currently exposed to noise levels greater than 55 dB DNL_{mr}. Under the F-35A aircraft scenarios, some portions of R-5107 and R-5103 would experience noise levels greater than 65 dB DNL_{mr} under Scenarios H2W, H3W, H3, H4, and H5, which could adversely impact the residents.

Table HO 3.11–8. Population Under the Proposed F-35A Primary Use Airspace at Holloman AFB

Airspace Units	*Counties Overflown*	*Total Affected Population (2010)*	*Total Population of Counties Overflown (2010)*	*Percentage of Total County Population*
Beak A/B/C MOAs and overlying Cowboy ATCAA	Chaves	65,498	65,645	35.6
	Lincoln		20,497	
	Otero		63,797	
	Socorro		17,866	
	Torrance		16,383	
Cato MOA[1]	Catron	2,184	3,725	10.1
	Socorro		17,866	
Pecos MOAs[1]	Chaves	4,309	65,645	3.8
	De Baca		2,022	
	Guadalupe		4,687	
	Lincoln		20,497	
	Roosevelt		19,846	
Talon Low/High West/High East MOA	Chaves	40,280	65,645	22.2
	Eddy		53,829	
	Otero		63,797	
R-5107B (Yonder and Lava)	Doña Ana	25,982	209,233	8.0
	Lincoln		20,497	
	Otero		63,797	
	Sierra		11,988	
	Socorro		17,866	
R-5107 C/H (Mesa)	Socorro	1,532	17,866	4.5
	Torrance		16,383	
R-5107 B/J (Red Rio)	Lincoln	402	20,497	1.0
	Socorro		17,866	
R-5107 B/D (Oscura)	Lincoln	710	20,497	0.8
	Otero		63,797	
R-5103 (McGregor and Centennial)	Otero	3,367	63,797	5.3

[1] Primary use airspace under Holloman AFB F-35A Scenarios H1W, H2W, and H3W.
Source: USCB 2010a, as analyzed using GIS.

F-35A flight operations at the three auxiliary airfields would be the same under all aircraft scenarios. Table HO 3.11–9 presents the estimated number of residents in the vicinity of each auxiliary airfield that would be exposed to noise levels greater than 65 dB DNL under baseline conditions and F-35A aircraft scenarios. As discussed in Section HO 3.11.1.2, the noise generated by the F-35A at these auxiliary airfields could have an adverse impact on property values for properties newly exposed to noise levels greater than 65 dB DNL and especially for properties newly exposed to noise levels above 75 dB DNL, which the EPA considers incompatible with residential use. This potential adverse impact on property values may be considered a significant impact on those residents affected by noise levels above 75 dB DNL.

Table HO 3.11–9. Estimated Residents Affected by Noise Levels Greater Than 65 dB DNL, Biggs AAF and EPIA

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario H1W/H1 (24 Aircraft)*	*Scenario H2W/H2 (48 Aircraft)*	*Scenario H3W/H3 (72 Aircraft)*	*Scenario H4 (96 Aircraft)*	*Scenario H5 (120 Aircraft)*
Biggs AAF						
Total ≥ 65	**638**	**667**	**701**	**736**	**769**	**786**
65–69	621	643	666	688	709	714
70–74	17	24	35	48	60	72
75–79	–	–	–	–	–	–
80–84	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–
EPIA						
Total ≥ 65	**1,295**	**1,643**	**2,241**	**2,590**	**2,857**	**3,179**
65–69	1,295	1,643	2,240	2,589	2,856	3,178
70–74	–	–	1	1	1	1
75–79	–	–	–	–	–	–
80–84	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–
RIAC						
Scenarios H1W, H2W, and H3W						
Total ≥ 65	**61**	**169**	**255**	**358**	**N/A**	**N/A**
65–69	60	167	249	338	N/A	N/A
70–74	1	2	6	20	N/A	N/A
75–79	–	–	–	–	N/A	N/A
80–84	–	–	–	–	N/A	N/A
≥ 85	–	–	–	–	N/A	N/A
Scenarios H1, H2, H3, H4, and H5						
Total ≥ 65	**61**	**66**	**164**	**247**	**368**	**558**
65–69	60	66	163	240	345	509
70–74	1	–	1	7	23	49
75–79	–	–	–	–	–	–
80–84	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–

Source: USCB 2010a, as analyzed using GIS.

HO 3.12 Environmental Justice and Protection of Children

HO 3.12.1 Base

The ROI for environmental justice and protection of children is defined as the region in which there is the potential for adverse impacts from construction or flight operations. This region includes the area potentially impacted by high noise levels. In accordance with the *Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process* (Air Force 1997c), the ROI is compared with the community of comparison, which is defined as Otero County. The definition of environmental justice and methodology for analysis are described in Chapter 3, Section 3.10.

HO 3.12.1.1 Base Affected Environment

The analysis of environmental justice for the base and vicinity considers changes in airfield noise levels caused by the F-35A beddown scenarios. The existing area affected by noise levels from Holloman AFB is depicted in Figure HO 3.2–2. Using 2010 census data, the number of persons affected by off-base noise from Holloman AFB was estimated. Under baseline conditions, an estimated 48 persons are affected by noise levels greater than 65 dB DNL (see Table HO 3.12–2). Of these persons affected, approximately 29.2 percent are minorities and 10.4 percent are low-income (see Section 3.12.1.2, Table HO 3.12–2).

Table HO 3.12–1 identifies total population and percentage populations of concern in Otero County, which serves as the community of comparison required for environmental justice analysis, as well as in the state of New Mexico and the United States.

Table HO 3.12–1. Total Population and Populations of Concern, 2010

Location	*Total Population*	*Percentage Minority*	*Percentage Low-Income*	*Percentage Youth*
Otero County	63,797	47.2	18.9	25.0
New Mexico	2,059,179	59.5	18.1	25.2
United States	308,745,538	36.3	13.5	24.0

Source: USCB 2010a, 2010b.

Minority persons represent 47.2 percent of the total population in Otero County and 59.5 percent of the state population. The minority population at the national level is 36.3 percent. Persons categorized as Hispanic or Latino were the predominant minority group, with 34.5 percent of the total population in Otero County and 46.3 percent at the state level.

The percentage of persons and families in Otero County with incomes below the poverty level was higher than state levels, averaging 18.9 percent in the county, compared with 18.1 percent in New Mexico.

The youth population, comprising children under the age of 18 years, constitutes 25.0 percent of the Otero County population, compared with 25.2 percent for New Mexico overall, and 24.0 percent for the United States. Two schools are located on Holloman AFB. These schools are affected by noise levels between 70 and 74 dB DNL under baseline conditions. There is also a child care center located on Holloman AFB, which is affected by 73 dB DNL noise levels.

HO 3.12.1.2 Base Environmental Consequences

The consequences to environmental justice and protection of children are presented separately under each F-35A aircraft scenario. There are some common elements to the analysis.

No disproportionately high and adverse human health or environmental effects on minority or low-income populations have been identified as a result of construction activities on Holloman AFB. Construction would occur within the Holloman AFB cantonment area and would not affect off-base populations.

Residents within the 65 dB DNL noise contour could be significantly affected by the increased noise.

Schools and child care centers are considered compatible with noise levels up to 75 dB DNL with additional noise attenuation. For noise levels above 75 dB DNL, educational services are not compatible regardless of noise attenuation. Additionally, these noise levels are not compatible with outdoor use and could contribute to hearing loss in children regularly exposed to aircraft noise.

Scenarios H1W, H2W, and H3W

Table HO 3.12–2 lists the estimated population affected by noise levels greater than 65 dB DNL under Scenarios H1W, H2W, and H3W, as well as the estimated share of minority and low-income populations affected. The estimated number of individual schools and child care centers affected by noise levels greater than 65 dB DNL are also listed in Table HO 3.12–2.

Table HO 3.12–2. Estimated Populations of Concern Affected by Noise Levels Greater Than 65 dB DNL, Baseline Conditions and Scenarios H1W, H2W, and H3W

	Total Affected Population (2010)	***Number (Percentage) Minority***	***Number (Percentage) Low-Income***	***Number of Schools***	***Number of Child Care Centers***
Baseline Conditions	48	14 (29.2)	5 (10.4)	2	2
Scenario H1W (24 Aircraft)	48	14 (29.2)	5 (10.4)	2	2
Scenario H2W (48 Aircraft)	48	14 (29.2)	5 (10.4)	2	2
Scenario H3W (72 Aircraft)	48	14 (29.2)	5 (10.4)	2	2

Source: USCB 2010a and 2010b, as analyzed using GIS.

As described in Section HO 3.12.1.1, in Otero County, which is defined as the community of comparison, the minority population constitutes 47.2 percent of the total population, and the low-income population constitutes 18.9 percent. Therefore, these F-35A aircraft scenarios would not present a disproportionately high and adverse environmental effect on minority or low-income populations because the share of affected populations of concern is substantially lower than the populations of concern in Otero County.

Under the baseline conditions, as well as Scenarios H1W, H2W, and H3W, the only schools and child care centers affected by noise levels greater than 65 dB DNL are the two on-base schools and the two on-base child care centers. The noise levels at the schools and child care centers under the baseline conditions and the F-35A aircraft scenarios would be between 70 and 74 dB DNL.

Therefore, the noise levels generated under the F-35A aircraft scenarios concerning schools and child care centers would have potential adverse impacts on children at these locations. Because noise levels at these locations would be below 75 dB DNL, these facilities could be made compatible with additional noise attenuation to address the potential adverse impacts. Additional detail concerning noise and the potential for interference with learning in terms of ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI 2009) is provided in Section HO 3.2, Noise.

Scenarios H1 Through H5

Table HO 3.12–3 lists the estimated population affected by noise levels greater than 65 dB DNL under Scenarios H1 through H5, as well as the estimated share of minority and low-income populations affected. The estimated number of individual schools and child care centers affected by noise levels greater than 65 dB DNL are also listed in Table HO 3.12–3.

Table HO 3.12–3. Estimated Populations of Concern Affected by Noise Levels Greater Than 65 dB DNL, Baseline Conditions and Scenarios H1, H2, H3, H4, and H5

	Total Affected Population (2010)	*Number (Percentage) Minority*	*Number (Percentage) Low-Income*	*Number of Schools*	*Number of Child Care Centers*
Baseline Conditions	48	14 (29.2)	5 (10.4)	2	2
Scenario H1 (24 Aircraft)	43	17 (39.5)	5 (11.6)	2	2
Scenario H2 (48 Aircraft)	43	17 (39.5)	5 (11.6)	2	2
Scenario H3 (72 Aircraft)	43	17 (39.5)	5 (11.6)	2	2
Scenario H4 (96 Aircraft)	43	17 (39.5)	5 (11.6)	2	2
Scenario H5 (120 Aircraft)	43	17 (39.5)	5 (11.6)	2	2

Source: USCB 2010a, 2010b, as analyzed using GIS.

These F-35A aircraft scenarios would not have a disproportionately high and adverse environmental effect on minority or low-income populations because the share of affected populations of concern is substantially lower than the populations of concern in Otero County.

Under the baseline conditions, as well as Scenarios H1 through H5, the only schools and child care centers affected by noise levels greater than 65 dB DNL are the two on-base schools and the two on-base child care centers. The noise levels at the schools and child care centers under the baseline conditions and the F-35A aircraft scenarios would be between 70 and 74 dB DNL.

Therefore, the noise levels generated under the F-35A aircraft scenarios in regards to schools and child care centers would have potential adverse impacts on children at these locations. Because noise levels at these locations would be below 75 dB DNL, these facilities could be made compatible with additional noise attenuation to address the potential adverse impacts. Additional detail concerning noise and the potential for interference with learning in terms of ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI 2009) is provided in Section HO 3.2, Noise.

HO 3.12.2 Airspace

The ROI for environmental justice and protection of children under the airspace to be used by the F-35A includes the counties or the portions of the counties under the primary use airspace. Primary use airspace has been defined as airspace that would be used by the F-35A on a daily basis. Occasional use airspace would be used by the F-35A when the primary use airspace is unavailable. The occasional use airspace would be used infrequently; therefore, potential

impacts on the areas underlying the occasional use airspace would be negligible. The definition of environmental justice and methodology for analysis are described in Chapter 3, Section 3.10.

HO 3.12.2.1 Airspace Affected Environment

The number of minority and low-income individuals and persons under the age of 18 under the primary use airspace was estimated using GIS analysis of 2010 census data. This information is provided in Table HO 3.12–4. Portions of the Mescalero Apache Reservation are located beneath the Beak MOAs/overlying Cowboy ATCAA.

Table HO 3.12–4. Populations of Concern Under the Primary Use Airspace

Airspace Units	*Counties Overflown*	*Total Affected Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
Beak A/B/C MOAs and overlying Cowboy ATCAA	Chaves	65,498	26,689	40.7	10,743	16.4	14,731	22.5
	Lincoln							
	Otero							
	Socorro							
	Torrance							
Cato MOA	Catron	2,184	801	36.7	385	17.6	424	19.4
	Socorro							
Pecos MOAs	Chaves	4,309	1,663	38.6	850	19.7	1,003	23.3
	De Baca							
	Guadalupe							
	Lincoln							
	Roosevelt							
Talon Low/High West/High East MOA	Chaves	40,280	16,394	40.7	6,961	17.3	10,424	25.9
	Eddy							
	Otero							
R-5107B (Yonder and Lava)	Doña Ana	25,982	12,596	48.5	4,555	17.5	6,431	24.7
	Lincoln							
	Otero							
	Sierra							
	Socorro							
R-5107 C/H (Mesa Ranges)	Socorro	1,532	918	59.9	338	22.1	388	25.4
	Torrance							
R-5107 B/J (Red Rio Range)	Lincoln	17,933	10,284	57.3	4,892	27.3	3,980	22.2
	Socorro							
R-5107 B/D (Oscura Range)	Lincoln	802	328	40.8	138	17.2	228	28.4
	Otero							
R-5103 (McGregor and Centennial)	Otero	1,661	1,024	61.6	450	27.1	446	26.9

Airspace Units	*Counties Overflown*	*Total Affected Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
IR-133/142	Guadalupe	6,795	3,314	48.8	1,304	19.2	1,479	21.8
	Lincoln							
	Socorro							
	Torrance							
IR-134/195	Chaves	7,078	4,356	61.5	2,020	28.5	2,026	28.6
	Eddy							
	Otero							
IR-192/194	Chaves	10,477	6,240	59.6	2,713	25.9	2,913	27.8
	Eddy							
	Otero							
	Culberson, Texas							
	Hudspeth, Texas							

Source: USCB 2010a, 2010b, as analyzed using GIS.

As part of the environmental justice analysis, the minority, low-income, and youth populations are presented for the communities of comparison, which are represented by the counties and states in which the airspace is located. This information is presented in Table HO 3.12–5.

In addition to the populations of concern under the airspace, the populations of concern were evaluated in the vicinity of the auxiliary airfields Biggs AAF and EPIA, located in El Paso County, Texas, and RIAC, located in Chaves County, New Mexico. The focus of the environmental justice analysis for the auxiliary airfields is the area potentially adversely impacted by noise contours. Figures HO 3.2–9 through HO 3.2–18 present the noise contours for each of the auxiliary airfields.

Table HO 3.12–5. Communities of Comparison Under Holloman AFB Airspace and Auxiliary Airfields

Community of Comparison	*Total Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
Catron[1]	3,725	893	24.0	437	11.7	590	15.8
Chaves	65,645	36,844	56.1	13,946	21.2	18,383	28.0
De Baca[1]	2,022	822	40.7	456	22.5	451	22.3
Doña Ana	209,233	146,241	69.9	51,481	24.6	55,858	26.7
Eddy	53,829	25,718	47.8	8,129	15.1	14,035	26.1
Guadalupe[1]	4,687	3,934	83.9	1,453	31.0	1,021	21.8
Lincoln	20,497	6,897	33.6	2,825	13.8	3,888	19.0
Otero	63,797	30,081	47.2	12,054	18.9	15,961	25.0
Roosevelt[1]	19,846	8,824	44.5	4,926	24.8	5,270	26.6
Sierra	11,988	3,783	31.6	3,041	25.4	1,928	16.1
Socorro	17,866	11,155	62.4	5,204	29.1	4,270	23.9
Torrance	16,383	7,210	44.0	3,186	19.4	3,951	24.1
New Mexico	2,059,179	1,225,369	59.5	371,858	18.1	518,672	25.2

Community of Comparison	*Total Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
Culverson County, Texas	2,398	1,894	79.0	683	28.5	667	27.8
Hudspeth County, Texas	3,476	2,848	81.9	1,339	38.5	1,047	30.1
El Paso County	800,647	695,401	86.9	212,823	26.6	240,813	30.1
Texas	25,145,561	13,748,216	54.7	4,217,479	16.8	6,865,824	27.3

[1] County is included under the primary use airspace under Scenarios H1W, H2W, and H3W only.
Source: USCB 2010a, 2010b.

The estimated number of residents affected by noise levels greater than 65 dB DNL under baseline conditions and F-35A aircraft scenarios is presented in Table HO 3.12–6. Baseline noise levels above 65 dB DNL affect 638 persons at Biggs AAF, 70.8 percent of which are minorities and 23.0 percent are low-income. No schools or child care centers are affected by noise levels greater than 65 dB DNL at Biggs AAF. At EPIA, 1,295 persons are currently affected by noise levels above 65 dB DNL, 91.4 percent of which are minorities and 29.7 percent are low-income. Three schools and two child care centers near EPIA are affected by noise levels greater than 65 dB DNL under baseline conditions. Baseline noise levels above 65 dB DNL at RIAC affect an estimated total of 61 persons, 60.7 percent of which are minorities and 21.3 percent are low-income. Three schools and one child care center near RIAC are affected by noise levels between 65 and 74 dB DNL under baseline conditions.

HO 3.12.2.2 Airspace Environmental Consequences

Noise levels in the Beak, Pecos, Cato, and Talon MOAs and overlying ATCAAs, R-5103 (McGregor and Centennial), and R-5107 (Lava E/W, Mesa L/H, and Yonder) under all Holloman AFB F-35A aircraft scenarios would not result in disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or children living under the airspace because the noise levels generated in the these airspace units under all scenarios would not exceed 65 dB DNL_{mr}. Portions of the Mescalero Apache Tribe are located under the Beak MOAs/overlying ATCAAs. Further discussion of this tribe is provided in Section HO 3.9.

Table HO 3.12–6. Populations of Concern Affected by Noise Levels Greater Than 65 dB DNL at Biggs AAF, EPIA, and RIAC

	Affected Population (2010)	*Number (Percentage) Minority*		*Number (Percentage) Low-Income*	
Biggs AAF					
Baseline Conditions	638	452	(70.8)	147	(23.0)
Scenario H1W/H1 (24 Aircraft)	667	467	(70.0)	152	(22.8)
Scenario H2W/H2 (48 Aircraft)	700	482	(68.9)	156	(22.3)
Scenario H3W/H3 (72 Aircraft)	736	501	(68.1)	162	(22.0)
Scenario H4 (96 Aircraft)	769	516	(67.1)	166	(21.6)
Scenario H5 (120 Aircraft)	786	524	(66.7)	167	(21.2)
EPIA					
Baseline Conditions	1,295	1,184	(91.4)	384	(29.7)
Scenario H1W/H1 (24 Aircraft)	1,644	1,482	(90.1)	487	(29.6)
Scenario H2W/H2 (48 Aircraft)	2,240	1,971	(88.0)	664	(29.6)
Scenario H3W/H3 (72 Aircraft)	2,590	2,270	(87.6)	767	(29.6)
Scenario H4 (96 Aircraft)	2,857	2,503	(87.6)	846	(29.6)
Scenario H5 (120 Aircraft)	3,179	2,794	(87.9)	942	(29.6)
RIAC					
Scenarios H1W, H2W, and H3W					
Baseline Conditions	61	37	(60.7)	13	(21.3)
Scenario H1W (24 Aircraft)	169	115	(68.0)	26	(15.4)
Scenario H2W (48 Aircraft)	255	175	(68.6)	57	(22.4)
Scenario H3W (72 Aircraft)	357	241	(67.5)	79	(22.1)
Scenarios H1, H2, H3, H4, and H5					
Baseline Conditions	61	37	(60.7)	13	(21.3)
Scenario H1 (24 Aircraft)	66	48	(72.7)	11	(16.7)
Scenario H2 (48 Aircraft)	164	119	(72.6)	36	(22.0)
Scenario H3 (72 Aircraft)	247	176	(71.3)	55	(22.3)
Scenario H4 (96 Aircraft)	368	251	(68.2)	82	(22.3)
Scenario H5 (120 Aircraft)	558	375	(67.2)	124	(22.2)

Source: USCB 2010a, 2010b, as analyzed using GIS.

Noise levels in R-5107 B/J and R-5107 B/D would increase to 65 dB DNL_{mr} and above under Scenarios H2W, H3W, H3, H4, and H5. Noise levels beneath the MTRs would not exceed 65 dB DNL_{mr}; however, noise levels would increase substantially under the F-35A scenarios as compared to baseline conditions. IR-134/195 is estimated to overlie disproportionately minority and low-income populations as compared to the counties as a whole included beneath the MTR. With an increase in noise levels from 49 dB DNL_{mr} under baseline conditions up to as high as 56 dB DNL_{mr} under Scenario H5, disproportionately high and adverse impacts on

minority and low-income populations may be expected from F-35A training on IR-134/195. As shown in Tables HO 3.12–4 and HO 3.12–5, the share of minority and low-income populations affected by noise levels greater than 65 dB DNL in the remaining primary use airspace is comparable to the minority and low-income populations in the communities of comparison. Therefore, noise levels generated by the F-35A in the primary use airspace, with the exception of IR-134/195, would not have a disproportionately high and adverse environmental effect on minority or low-income populations.

Noise levels at the auxiliary airfields for Holloman AFB F-35A training activities would increase compared with baseline noise levels. Table HO 3.12–6 lists the number and percentage of minority and low-income populations affected by noise levels greater than 65 dB DNL under each F-35A aircraft scenario.

For Biggs AAF and EPIA, El Paso County, Texas, is the community of comparison. Information on the populations of concern in El Paso County is presented in Table HO 3.12–5. In the vicinity of Biggs AAF and EPIA, the share of minority and low-income populations affected by noise levels greater than 65 dB DNL is comparable to the share of minority and low-income populations in El Paso County (see Table HO 3.12–6). Therefore, in the vicinity of Biggs AAF and EPIA, no disproportionately high and adverse human health or environmental effects on minority or low-income populations are anticipated.

At RIAC, Chaves County, New Mexico, is the community of comparison. Information on the populations of concern in Chaves County is presented in Table HO 3.12–5. The minority populations affected by noise levels greater than 65 dB DNL are greater than the minority populations in Chaves County under baseline conditions, as well as under the F-35A aircraft scenarios. The low-income populations affected by the noise levels are comparable to the low-income populations in Chaves County (see Table HO 3.12–6). Therefore, noise levels would have a disproportionately high and adverse impact on minority populations but not on low-income populations.

Table HO 3.12–7 presents the number of schools estimated to be affected by noise levels greater than 65 dB DNL under baseline conditions and F-35A aircraft scenarios for EPIA and RIAC. Table HO 3.12–8 presents the number of child care centers estimated to be affected by noise levels greater than 65 dB DNL for EPIA and RIAC. No schools or child care centers have been identified near Biggs AAF as being affected by noise levels greater than 65 dB DNL.

As discussed under Section 3.12.1.2, schools are considered compatible with noise levels up to 75 dB DNL with additional noise attenuation. For noise levels above 75 dB DNL, educational services are not compatible regardless of noise attenuation. Additionally, these noise levels are not compatible with outdoor use and could contribute to hearing loss in children regularly exposed to aircraft noise. Therefore, the noise levels generated under the F-35A aircraft scenarios in regard to schools would have potential adverse impacts on children at these locations. Additional detail concerning noise and the potential for interference with learning in terms of ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI 2009) is provided in Section HO 3.2, Noise.

Table HO 3.12–7. Schools Affected by Noise Levels Greater Than 65 dB DNL at EPIA and RIAC

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario H1W/H1 (24 Aircraft)*	*Scenario H2W/H2 (48 Aircraft)*	*Scenario H3W/H3 (72 Aircraft)*	*Scenario H4 (96 Aircraft)*	*Scenario H5 (120 Aircraft)*
EPIA						
Total ≥ 65	**3**	**5**	**5**	**6**	**7**	**7**
65–69	3	5	5	6	7	7
70–74	–	–	–	–	–	–
75–79	–	–	–	–	–	–
80–84	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–
RIAC						
Total ≥ 65	**2**	**3**	**3**	**3**	**4**	**4**
65–69	1	1	1	1	1	1
70–74	1	2	1	1	1	1
75–79	–	–	1	1	2	2
80–84	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–

Note: No schools in the vicinity of Biggs AAF would be affected by noise levels greater than 65 dB DNL.

Table HO 3.12–8. Child Care Centers Affected by Noise Levels Greater Than 65 dB DNL at EPIA and RIAC

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario H1W/H1 (24 Aircraft)*	*Scenario H2W/H2 (48 Aircraft)*	*Scenario H3W/H3 (72 Aircraft)*	*Scenario H4 (96 Aircraft)*	*Scenario H5 (120 Aircraft)*
EPIA						
Total ≥ 65	**2**	**3**	**3**	**3**	**3**	**4**
65–69	2	3	3	3	3	4
70–74	–	–	–	–	1	2
75–79	–	–	–	–	–	–
80–84	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–
RIAC						
Total ≥ 65	**–**	**1**	**1**	**1**	**1**	**1**
65–69	–	1	1	1	1	–
70–74	–	–	–	–	–	1
75–79	–	–	–	–	–	–
80–84	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–

Note: No child care center near Biggs AAF would be affected by noise levels greater than 65 dB DNL.

HO 3.13 Infrastructure

HO 3.13.1 Base

HO 3.13.1.1 Base Affected Environment

Potable Water System. Holloman AFB relies on surface water and groundwater supplies for potable water. The City of Alamogordo and various wells located 12 to 15 miles east of the base near the foothills of the Sacramento Mountains provide potable water to Holloman AFB. Surface water from Bonito Lake and natural springs located in Fresnal and La Luz Canyons is transported through pipelines to reservoirs at the City of Alamogordo's La Luz water treatment plant. The La Luz water treatment facility transports treated water to the Boles Field Pumping Station, then to the base via pipeline. Three tanks are designated for potable water storage on Holloman AFB: Eagle Tower has a capacity of 0.3 million gallons (0.9 acre-feet); Challenger Tank has a capacity of 0.4 million gallons (1.2 acre-feet); and North Area Tower has a capacity of 0.25 million gallons (0.8 acre-feet), with a total capacity of 0.95 million gallons (2.9 acre-feet). These three tanks also serve to keep pressure on water in pipelines serving the base and are constantly being filled by water pumped via pipeline from off-base locations.

Groundwater is drawn from 15 wells with an average depth of 450 to 550 feet from five well fields, including Boles, Escondido, San Andreas, Frenchy, and Douglas. Some of these wells have been installed to depths of 1,000 feet below ground surface. Groundwater extracted from the well fields is transported via pipeline to two ground-level storage tanks with a total capacity of 0.9 million gallons (Holloman AFB 2006). These water storage tanks are constantly being filled to prevent water deficits from occurring on base. The average base usage for FY2009 was 1.2 million gallons per day (MGD) (451.7 million gallons per year).

Sanitary Sewer System. Holloman AFB has an existing gravity sewer system that handles the base wastewater flow and a wastewater treatment plant (WWTP) with a maximum design capacity of 4.5 MGD and an average flow of 1.0 MGD (Holloman AFB 2006). Wastewater discharge from the Holloman AFB WWTP is regulated under NPDES Permit No. NM0029971. The facility discharges to receiving waters named Lagoon G, unnamed jurisdictional wetlands, and Lake Holloman in Segment No. 20.6.4.99 within the Rio Tularosa Closed Basin. Alamogordo has one WWTP that treats an estimated 3 MGD of wastewater with a peak flow of approximately 6 MGD (Alamogordo 2010a).

Storm Water Drainage System. Many areas within Holloman AFB are subject to extensive ponding of rainfall runoff during various storm events, with most runoff directed to inadequately sized retention basins located in open space areas.

Storm water on Holloman AFB is regulated under NPDES Multi-Sector General Permit No. MSGP-2000, which considers industrial activities associated with airfield operations to be covered under the industrial permit. The permit recognizes the potential for runoff contamination, authorizes the discharge of storm water associated with specific industrial activities, and requires monitoring activities. The EPA requires the development and implementation of an SWPPP as a requirement for compliance with NPDES storm water permits. The SWPPP is an engineering and management strategy prepared specifically for Holloman AFB to improve the quality of the storm water runoff and thereby improve the

quality of the receiving waters. The SWPPP is amended whenever there is a change in facility design, construction, operation, or maintenance that materially affects the potential for storm water contamination at the facility. Any amendments are implemented to the maximum extent practicable after such a change occurs.

Solid Waste Management. Holloman AFB does not operate an onsite solid waste facility (landfill) so it uses a State of New Mexico contractor for nonhazardous solid waste disposal. Dumpsters are located throughout the base for collection of office waste and inert industrial solid waste. All solid waste is collected and transported off site for disposal. Construction solid waste is transported to the Mesa Verde Landfill, and the remaining solid waste is transported to the Lincoln Otero County Landfill. Solid waste disposal for calendar year 2009 at Holloman AFB was 2,700 tons.

Electrical System. Electrical service is supplied to Holloman AFB by the El Paso Electric Company using a 115-kilovolt switching station located near the main gate. The El Paso Electric 115-kilovolt line is run to three 115-kilovolt/13.2-kilovolt substations (Main, North, and Atlas) on the base. The Main and North substations are capable of providing power to the entire base and the overall system capacity is approximately 65 megavolt-ampere. The current total base system loads have a historical peak average of 21 megavolt-ampere. In FY2010, the base consumed a total of 80,720,241-kilowatt hours.

Natural Gas System. Natural gas is used primarily for space heating, incineration, hot water heaters, and small gas furnaces at Holloman AFB. Natural gas service is provided to Holloman AFB by the New Mexico Gas Company. In FY2010, the base purchased 300,301 thousand cubic feet.

HO 3.13.1.2 Base Environmental Consequences

Potable Water System. Under the F-35A aircraft scenarios, the largest net change in personnel associated with the change in mission would be an increase of approximately 5,588 personnel (including dependents); this would occur under Scenario H3W. The most recent data regarding municipal water consumption for the Alamogordo area indicate that municipal water use in 2005 was about 4.43 MGD (Alamogordo 2007b) and base use was 1.2 MGD. With an average per capita household water use estimation of about 70 gallons per day (AWWA 2010), it is anticipated that additional personnel associated with Scenario H3W would result in an increase of approximately 391,160 gallons per day. This represents a potential increase of about 6.95 percent of the latest demand statistics.

Adverse impacts associated with increases in potable water usage may occur under scenarios in which water usage may increase between 6 and 10 percent. Water shortages have been well documented in the southwest, and given the population of the Alamogordo area, an increase of about 6.95 percent in demand is considerable when tied to water usage. Currently, the city is developing new conservation measures and trying to secure additional water supplies to meet current and projected demands (Alamogordo 2007b). The potential impacts associated with increased water usage in the area may be mitigated by implementing water conservation measures for on-base housing or for personnel residing off base (e.g., water conservation directives for off-base personnel, utility compensation incentives).

Wastewater. The EPA estimates that the average person generates approximately 70 gallons of wastewater per day between showering, toilet use, and general water use (EPA 2005). Potential increases in wastewater generation under each scenario are presented in Table HO 3.13–1. Alamogordo has one WWTP that treats an estimated 3 MGD of wastewater, with peak flow of approximately 6 MGD (Alamogordo 2007c). The Holloman AFB WWTP has a maximum design capacity of 4.5 MGD, with an average flow of 1.0 MGD. Increases in off-base wastewater generation would be between 1 and 13 percent of current treatment statistics. However, since the peak flow is approximately double the normal treatment statistics, even a 13 percent increase of the average daily flow would not result in an adverse impact. Substantial increases in wastewater production for the base WWTP would occur under most scenarios were all personnel and their dependents to live on base; this could potentially place operating burdens on the base WWTP given current capacity. However, even under Scenario H3W, there would still be some capacity headroom. While it is unknown whether the majority of personnel would reside on or off base, it is likely that personnel would be distributed in both locations, thereby reducing the potential impact on respective WWTPs.

Table HO 3.13–1. Percentage of Potential Increases in Potable Water/Wastewater

Aircraft Scenario	*Net Personnel Change (Including Dependents)*	*Volume of Water (Potable Water and Wastewater) Per Day (gallons)*	*Percentage of Potable Water Use Increase Over Baseline Conditions*	*Percentage of Wastewater Generation Increase Over Baseline Conditions*	
				Base WWTP	**City WWTP**
Scenario H1W (24 Aircraft)	2,260	158,200	2.8	15.8	5.3
Scenario H2W (48 Aircraft)	3,922	274,540	4.8	27.4	9.1
Scenario H3W (72 Aircraft)	5,588	391,160	6.9	39.1	13
Scenario H1 (24 Aircraft)	(1,157)	–	–	–	–
Scenario H2 (48 Aircraft)	505	36,350	0.6	3.6	1.2
Scenario H3 (72 Aircraft)	2,170	151,900	2.7	15.1	5.1
Scenario H4 (96 Aircraft)	3,832	268,240	4.7	26.8	8.9
Scenario H5 (120 Aircraft)	5,494	384,580	6.8	38.4	12.8

Note: (Number) denotes a negative number.

Sanitary Sewer System. There is an anticipated increase in personnel associated with the F-35A aircraft scenarios; however, the existing base sanitary sewer system is adequate to serve the facilities proposed under the F-35A aircraft scenarios. Thus, no impact on the sanitary sewer system at Holloman AFB is anticipated.

Storm Water Drainage System. A high percentage of the active administrative and industrial areas of the installation are paved or roofed and exhibit high runoff coefficients. Drainage of the built-upon area is by overland flow to storm drain inlets and inadequately sized catch basins, which are collected by a network of underground pipes.

Storm water on Holloman AFB is regulated under the NPDES Multi-Sector General Permit (Permit No. MSGP-2000), and Holloman AFB has an existing SWPPP (Holloman AFB 2005a) that currently complies with the requirements of the EPA NPDES Multi-Sector General Permit. The Holloman AFB SWPPP would be amended to reflect changes in facility design, construction, operation, or maintenance that materially affect the potential for storm water contamination at the facility resulting from the F-35A aircraft scenarios. Any amendments would be implemented to the maximum extent practicable after such changes occur.

Solid Waste Management. Holloman AFB does not operate an onsite solid waste facility (landfill). All solid waste is collected and transported off site for disposal. Solid wastes from construction projects are transported to the Mesa Verde Landfill, and remaining solid waste is transported to Lincoln Otero County Landfill. Off-base contractors completing any demolition and construction projects at the Holloman AFB installation would be responsible for disposing of waste generated by these activities. Contractors would be required to comply with Federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled, reused, or otherwise diverted from landfills. All nonrecyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste, including waste contaminated with hazardous waste, asbestos-containing material (ACM), lead-based paint (LBP), or other undesirable components, would be managed in accordance with AFI 32-7042, *Waste Management* (Air Force 2009b). Thus, only minor impacts on the solid waste management system at the Holloman AFB installation are anticipated due to the proposed demolition and construction. Solid waste generated by the additional personnel associated with F-35A aircraft scenarios would be transported off site.

Electrical System. The demand for energy (primarily electricity) would increase during the demolition, construction, or operational phases under all of the F-35A aircraft scenarios. The Air Force has estimated that electrical use for 1,794,980 square feet of new or modified operations, training, and maintenance facilities associated with Scenario H3W would be 33,915,100 kilowatt-hours annually. The Air Force has estimated that electrical use for 1,473,000 square feet of new or modified space would be 27,840,680 kilowatt-hours annually. To estimate the electrical use associated with personnel and their dependents, data from the U.S. Energy Information Administration (USEIA 2010) were used to identify that consumers averaged about 7,580 kilowatt-hours per person (841,329 users) in New Mexico in 2008 (the best available statistics), with a total of about 6,377,273,820 kilowatt-hours consumed. At a maximum potential increase of 5,588 additional people under Scenario H3W, a potential increase of about 42,357,040 kilowatt-hours of electricity can be anticipated. This represents less than 1 percent of total usage in 2008. Even under an optimal usage scenario, this increase is very small; scenarios of less than 120 aircraft are expected to result in fewer impacts. In addition, the Air Force expects increases in electrical use associated with new facilities to be minimal, given LEED [Leadership in Energy and Environmental Design] requirements for energy efficiency. The electrical energy supply grid at the Holloman AFB installation is adequate and would not be affected.

Natural Gas System. The natural gas energy supply grid at Holloman AFB is adequate and would not be affected under the F-35A aircraft scenarios. As additional heated working and administrative spaces are developed and operations increase under the F-35A aircraft scenarios,

the Air Force estimates that natural gas consumption could increase by 64,080,750 cubic feet under Scenario H3W and 52,587,960 cubic feet under Scenario H5. For residential consumption estimations, according to the U.S. Energy Information Administration (USEIA 2010), approximately 556,905 residential consumers in New Mexico used about 32,375 million cubic feet of natural gas in 2009. This equates to an average of about 0.06 million cubic feet per person per year. Under Scenario H3W, the largest potential increase in people would be 5,588. Assuming all persons use natural gas, which is unlikely, the greatest potential increase in consumption would be 357 million cubic feet annually. This equates to an increase of approximately 1 percent in natural gas usage, with this number likely being much less. Even under an optimal usage scenario, this increase is very small; scenarios of less than 120 aircraft are expected to result in fewer impacts.

HO 3.14 Transportation

HO 3.14.1 Base

HO 3.14.1.1 Base Affected Environment

Regional Access. Regional access to Alamogordo and Holloman AFB is provided by U.S. Routes 54 and 70. U.S. Route 54 is a four-lane highway that runs north–south, connecting Alamogordo to El Paso, Texas, to the south and to Tularosa, New Mexico, to the north. U.S. Route 70 is a four-lane, divided highway that runs generally northeast–southwest and provides access from Alamogordo to Las Cruces, New Mexico, to the south and to Ruidoso, New Mexico, to the north. A recent highway-improvement project upgraded the 7-mile portion of U.S. Route 70 between Alamogordo and Holloman AFB from four to six divided lanes. U.S. Route 82, a less-frequently-traveled highway, runs east–west from Alamogordo through small communities in the Sacramento Mountains to the east and provides access to Artesia and the Texas border. The closest interstate highway is Interstate 25 at Las Cruces, approximately 50 miles southwest of Holloman AFB.

The nearest commercial airport to Holloman AFB (approximately 5 miles east) is Alamogordo/White Sands Regional Airport (formerly Alamogordo Regional Airport), a general aviation airport with one 7,000-foot asphalt runway and one 3,500-foot dirt runway. It offers commercial service to El Paso and Albuquerque via one commercial carrier, New Mexico Airlines.

The nearest rail line is owned and operated by Union Pacific and provides freight service from El Paso, Texas, to Wichita, Kansas. Near Holloman AFB, the line runs through Fort Bliss and then parallels U.S. Route 54 through Alamogordo and runs northeast to the New Mexico–Texas border. A spur line owned and maintained by the U.S. Army once serviced Holloman AFB, but the line is currently not in service and is disconnected at the U.S. Route 54/70 bypass (though the right-of-way for the spur is maintained). Amtrak offers passenger rail service in El Paso via the Sunset line, which runs from New Orleans to Los Angeles (Amtrak 2009).

Gate Access. Holloman AFB has a total of three active access gates. The main gate is accessed via U.S. Route 70 approximately 6 miles west of the U.S. Route 54/70 intersection in Alamogordo. The main gate, which includes an overpass to allow direct access to U.S. Route 70

eastbound from the base, is operated continuously and is the only gate allowing 24-hour access to the base. A traffic study in 1994 determined that the ramp from westbound U.S. Route 70 to First Street operates above capacity and is subject to congested conditions during the morning rush (Holloman AFB 2009a). The west access gate is located approximately 1 mile west of the main gate at the intersection of U.S. Route 70 and West Gate Avenue and is utilized for all commercial traffic and for base personnel working in western areas of the base. The La Luz gate is located at the northeastern corner of the base and serves as an access point for base personnel who live in areas north of Alamogordo, but is only open 6 hours per day. The gate is accessible from U.S. Routes 54/70, just north of the Alamogordo city limit, via La Luz Gate Road. A new commercial and hazardous cargo gate 3 miles west of the current west gate is planned to provide access to the West Ramp Area. This route would greatly enhance safety and security by providing much longer queuing space, greater stand-off for security forces, and direct access to the suspect vehicle holding area. This gate would route all heavy and hazardous cargo away from the residential, recreational, and mission-sensitive work areas along the current route.

On-Base Circulation. The road network on Holloman AFB is organized into arterials (moderate- or high-capacity roads, just below highway capacity), collector (low- or moderate-capacity roads), and local streets (low-capacity roads). Primary on-base arterials include First Street (a four-lane, undivided road with a continuous turning lane) and West Gate Avenue, since these lead directly to and from the main cantonment gates. Other arterials include Delaware Avenue, New Mexico Avenue, and Forty-Niner Avenue. Primary collector streets are Mesquite Road, Eleventh Street, Fifth Street, Arnold Avenue, Arizona Avenue, and Santa Fe Drive. Each is two lanes. Kelly Road is classified as a collector street, and provides access to and around the far west side of the airfield. The only traffic signal on base is located at the intersection of New Mexico Avenue and First Street (Holloman AFB 2009a).

HO 3.14.1.2 Base Environmental Consequences

Construction-Related Impacts. Implementation of any of the scenarios H1W through H3W or H1 through H5 would require delivery of materials to and removal of construction-related debris from construction and renovation sites. However, construction traffic would make up only a small portion of the total existing traffic volume in the area and at the base. Increased traffic during construction could contribute to degradation of the internal road surfaces, congestion at the gates, and delays in the processing of access passes. The use of the commercial access gate at Holloman AFB would reduce the potential for congestion at the main gate off U.S. Route 70. The potential for short-term increases in traffic are not likely to substantially affect commute times. No long-term impacts on on- or off-base transportation systems would result.

Operations. Under Scenarios H1W, H1, H2, and H3, there would be a decrease or slight increase in on-base mission personnel of less than 740 persons, or up to a 10 percent increase in daily commuting traffic to and from the base. In addition to the increase in personnel, there would be a small increase in dependent and commercial traffic. This assumes that all personnel and dependents live off base, work standard workdays, and drive individually to the installation. The three gates that provide access to Holloman AFB have been recently upgraded and have multiple lanes and adequate cueing areas available to handle traffic during morning

and evening rush hours. The increase in the amount of vehicles passing through these gates would not have a discernable effect on traffic flow. Therefore, implementation of these scenarios would be accommodated without increased congestion to the local transportation system.

With the implementation of Scenario H2W or H4, base mission personnel would increase by up to 16 percent, with a similar increase in traffic flows during morning and evening rush hours. These scenarios would result in an increase in the congestion at the three base gates. The base may adjust the schedule of operations to accommodate this increase or provide additional personnel at the gates to process security checks during the peak hours.

If Scenario H3W or H5 is selected, base personnel would increase by between 16 and 21 percent over baseline levels. These scenarios would result in an increase in the congestion at the three base gates during the morning and evening workday rush hours. In addition to the adjustments noted under previous scenarios, the base may have to construct additional lanes and provide additional personnel to conduct security checks.

HO 3.15 Hazardous Materials and Waste

HO 3.15.1 Base

HO 3.15.1.1 Base Affected Environment

Hazardous Materials and Waste. The majority of hazardous materials used at Holloman AFB are controlled by the hazardous materials pharmacy. This pharmacy tracks products used at Holloman AFB and ensures that they are utilized prior to the expiration of their shelf life. This system also operates a just-in-time ordering system to greatly reduce the amount of hazardous materials stored on site. Most hazardous materials used by Holloman AFB are controlled through the Air Force Pollution Prevention Program Plan, which provides centralized management of the procurement, handling, storage, issuance, turn-in, recovery, reuse, or recycling of hazardous materials. Development of these plans includes review and approval by Air Force personnel to ensure that users are aware of exposure and safety risks. Base management plans further serve to ensure compliance with applicable Federal, state, and local regulations.

Aircraft flight operations and maintenance, as well as installation maintenance, require the storage and use of many types of hazardous materials, such as flammable and combustible liquids. These materials include acids, corrosives, caustics, glycols, compressed gases, aerosols, batteries, hydraulic fluids, solvents, paints, pesticides, herbicides, lubricants, fire retardants, photographic chemicals, alcohols, and sealants.

Holloman AFB is a large-quantity hazardous waste generator, generating more than 2,200 pounds of nonacute hazardous waste per month. Hazardous wastes are generated from a variety of functions on base, including aircraft and vehicle operations and maintenance, medical and dental facilities, cleaning and degreasing operations, and various maintenance and paint operations. These wastes include solvents, paints and paint-related material, absorbent material, rags and debris, blast material, and expired shelf-life material. Holloman AFB recycles

all lubricating fluids, batteries, oil filters, and shop rags. Hazardous wastes generated are managed in accordance with the Holloman AFB Hazardous Waste Management Plan.

Initial Accumulation Point (IAP) managers are responsible for properly segregating, storing, characterizing, labeling, marking, packaging, and transferring all hazardous wastes for disposal from the IAP to the established 90-day storage area according to Federal, state, local, and Air Force regulations. The hazardous waste program manager is responsible for characterizing and profiling each waste stream. There are approximately 39 hazardous waste IAPs located at Holloman AFB. Approximately 36,646 pounds of hazardous wastes were disposed of in FY2009.

Holloman AFB has one less-than-90-day site (Building 149), which allows the base to store hazardous waste for up to 90 days before transfer to the Defense Reutilization Market Office. The 90-day site is currently operated by a contractor, with the base retaining quality control of the site. Hazardous wastes generated on base and not stored in an IAP must be characterized, profiled, and moved to the 90-day site the same day they are rendered as waste. Wastes generated on base are managed under regulations set forth in Holloman AFB's Resource Conservation and Recovery Act Part B permit. Holloman AFB also holds a Resource Conservation and Recovery Act permit for handling the disposal and treatment of waste munitions.

Existing storage tanks and capacity for Jet Propellant-8 would be used for the Holloman AFB site, and these tanks are currently operated under a Spill Prevention, Control, and Countermeasures Plan in place for the base. Hazardous materials and waste used and generated at Holloman AFB are currently managed under existing management procedures, which are sufficient to prevent any significant impact on the environment at the base or any significant impact on the general public.

Environmental Restoration Program. The DoD developed the Environmental Restoration Program (ERP) to identify, investigate, and remediate potentially hazardous material disposal sites that existed on DoD property prior to 1984. Seventy-one ERP sites, eight areas of concern, and 106 solid waste management units have been identified at Holloman AFB. Of the 71 sites, 36 have been closed with no further response action planned; 9 have been closed with remedial action operations; 15 have been closed with long-term monitoring or require no further action; 3 are in the preliminary assessment/site investigation stage; and 1 is in the remedial design stage.

The Holloman AFB Environmental Restoration Program Management Action Plan (Holloman AFB 2005b) identifies the current status of the sites, including solid waste management units and areas of concern, and presents a comprehensive strategy for implementing actions necessary to protect human health and the environment. This strategy integrates activities under the ERP and the associated environmental compliance programs that support full restoration of the base.

Air Combat Command policy requires that any proposed project on or near a Holloman AFB ERP site be coordinated through the Holloman ERP manager and obtain construction waivers from Air Combat Command.

Toxic Substances. ACMs are those materials that contain greater than 1 percent asbestos. Friable, finely divided, and powdered wastes containing greater than 1 percent asbestos are subject to regulation. A friable waste is one that can be reduced to a powder or dust under hand pressure when dry. Nonfriable ACMs, such as floor tiles, are considered to be nonhazardous, except during removal and/or renovation, and are not subject to regulation.

An Asbestos Management Plan provides guidance for the identification of ACMs and the management of asbestos wastes. An Asbestos Facility Register is maintained by 49th Civil Engineer Squadron. The design of building alteration projects and requests for self-help projects are reviewed to determine if ACMs are present in the proposed work area. ACM wastes are removed by a contractor and disposed of in accordance with Federal and state regulations.

LBP is defined as surface paint that contains lead in excess of 1 milligram per square centimeter, as measured by x-ray fluorescence spectrum analyzer, or 0.5 percent lead by weight. Several structures have the potential to have LBP on building surfaces. Demolition and renovation of facilities with LBP require special procedures and disposal. In 1993, under 29 CFR Part 1926, OSHA restricted the permissible exposure limit for general industrial workers to 50 micrograms per cubic centimeter of air, which would include workers in the construction field.

HO 3.15.1.2 Base Environmental Consequences

Hazardous Materials and Waste. Under the F-35A aircraft beddown scenarios, the quantities of hazardous materials and petroleum substances used throughout the Holloman AFB installation may increase slightly in the long term due to the net increase in aircraft. The F-35A aircraft has a composite body and should require less painting. Paint waste is a major component of the base's current waste stream. Short-term increases in the quantities of hazardous materials and petroleum substances are expected and would be realized in terms of the quantity of fuel stored and used during construction activities because various fuels (e.g., diesel, gasoline) would be required to run earthmoving equipment and power tools and to provide electricity and lighting as conditions warrant. In addition, the number of sites storing, using, and handling hazardous materials may change slightly under the F-35A aircraft beddown scenarios; however, the authorization process already in place for the acquisition of these materials would ensure that only the specific types and quantities necessary to carry out the mission would be brought to the Holloman AFB installation.

The quantity of hazardous waste generated at the Holloman AFB installation is not expected to change significantly as a result of the F-35A aircraft beddown scenarios, and Holloman AFB would remain a large-quantity generator pursuant to the Resource Conservation and Recovery Act. If any new hazardous waste generation or handling areas (e.g., IAPs) are established as a result of the F-35A aircraft beddown scenarios, they would be managed in accordance with the installation's Hazardous Waste Management Plan, which would be updated to reflect the changes.

Environmental Restoration Program. The proposed footprints for most construction and demolition projects associated with the F-35A aircraft scenarios are not known at this time. Construction and demolition would take place at or near ERP Sites SS-56 and SS-60 near the new aircraft parking area. The action would require coordination through the Holloman AFB

ERP Manager and construction waivers from Air Combat Command. As projects are sited and designed, coordination with the 49th Civil Engineer Squadron would occur to determine any potential for disturbance of past ERP sites. It is possible that undocumented contaminated soils from historical fuel spills may be present beneath portions of the installation. Any potential impacts associated with unknown contamination would be mitigated through worker awareness and safety training.

Toxic Substances. Prior to any demolition associated with the F-35A aircraft beddown scenarios, surveys would be conducted to determine the presence of ACMs. If ACMs are present, the Holloman AFB installation would employ appropriately trained and licensed contractors to perform the ACM removal work and would notify the contractors of the presence of ACMs so that appropriate precautions could be taken to protect the health and safety of the workers. ACMs would be segregated for disposal and managed in accordance with applicable Federal, state, and local regulations.

Prior to any demolition associated with the F-35A aircraft beddown scenarios, surveys would also be conducted to determine the presence of LBP. If LBP is present, the Holloman AFB installation would employ appropriately trained and licensed contractors to perform work involving the LBP and would notify the contractor of the presence of LBP so that appropriate precautions could be taken to protect the health and safety of the workers.

HO 4.0 Holloman AFB Cumulative Effects and Irreversible and Irretrievable Commitment of Resources

CEQ regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person (Federal or non-Federal) undertakes such other actions" (40 CFR 1508.7). In this section, an effort has been made to identify past and present actions in the Holloman AFB region and those reasonably foreseeable actions that are in the planning phase or unfolding at this time. Actions that have a potential to interact with the beddown of F-35A at Holloman AFB are included in this cumulative analysis. This approach enables decision makers to have the most current information available so that they can evaluate the environmental consequences of the beddown of F-35A aircraft at Holloman AFB; use of auxiliary airfields RIAC, EPIA, and Biggs AAF; and training in associated airspace.

Holloman AFB is an active military installation, home of the 49 WG, supporting pilot and sensor operator training in MQ-1 (Predator) and MQ-9 (Reaper) remotely piloted aircraft. As discussed in Chapter 2, in 2010, the Department of the Air Force announced plans to consolidate the F-22 fleet, resulting in removal of the two F-22 squadrons from Holloman AFB to other locations. To utilize the extensive infrastructure and assets available at Holloman AFB, the base was selected to host the F-16 FTU to be relocated from Luke AFB. The F-16 FTU is expected to complete its beddown by FY2013. The installation also supports tenant units, including the GAF Tactical Training Center which provides aircrew training in Tornado aircraft, and the 46th Test Group test mission, which performs high-speed sled track testing, navigation and guidance system testing, radar signature measurements, and weapon systems flight testing at facilities on Holloman AFB and WSMR. The installation undergoes changes in mission and in training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the installation requires new construction, facility improvements, infrastructure upgrades, and other maintenance/repairs on a nearly continual basis. Although known construction and upgrades are a part of the analysis contained in this document, some future requirements cannot be predicted. As those requirements surface, future National Environmental Policy Act analysis will be conducted, as necessary.

HO 4.1 Past, Present, and Reasonably Foreseeable Actions

In the early 1990s, the primary unit at Holloman AFB, then called the 49th Tactical Fighter Wing, was redesignated as the 49 FW and saw the last of its F-15s depart (which had operated at Holloman AFB from the late 1970s), and replaced by the F-117 stealth fighter. Between 1977 and 1991, the 479th Tactical Training Wing provided initial pilot training for pilots assigned to fly the F-15 Eagle. For this mission, the 479th Tactical Training Wing utilized up to four squadrons of AT-38B Talons for training missions. In July 1993, the GAF Tactical Training Center began training at Holloman AFB using Air Force–owned F-4 aircraft. By the late 1990s, the GAF transitioned to German-owned Tornado aircraft, and the GAF continues to train with Tornadoes today and a small number of QF-4 drones.

In 2006, the F-117 was replaced by the F-22 Raptor, which used the regional training airspace with more training at higher altitudes. The beddown of the F-16 FTU would utilize the same regional training airspace with more emphasis on the F-16's air-to-ground mission through more frequent use of the air-to-ground ranges on WSMR and Fort Bliss. Additionally, as a training unit, the F-16 FTU would use RIAC as an auxiliary airfield. These activities are included as baseline operations described in Section HO 2.0.

Table HO 4.1–1 summarizes past, present, and reasonably foreseeable actions within the region that could interact with the beddown of F-35A at Holloman AFB. The table briefly describes each identified action, presents the proponent or jurisdiction of the action and the timeframe (e.g., past, present/ongoing, future), and indicates which resources potentially interact with the beddown of F-35A at Holloman AFB. Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the region surrounding Holloman AFB.

HO 4.2 Cumulative Impacts

The following analysis considers how the impacts of the actions in Table HO 4.2–1 might affect or be affected by the F-35A beddown scenarios at Holloman AFB. The analysis considers whether such a relationship would result in potentially significant impacts not identified when the beddown of F-35A at Holloman AFB is considered alone.

Holloman AFB. Most of the recent construction on Holloman AFB is already reflected in baseline conditions. However, F-35A development would add to total impervious surface on Holloman AFB, particularly around the airfield. Any F-35A construction could overlap with ongoing implementation of programmed development projects at Holloman AFB. Sound engineering and management practices would minimize construction impacts. Additional impervious surface at the airfield would require installation of appropriate storm water system improvements that integrate with existing systems and constructed wetlands to the south of the airfield. Additional personnel (whether residing on base or in surrounding communities) would increase water consumption. Water supply is a growing issue in this arid area and has prompted Alamogordo's proposal for a desalination plant. Increased demand for potable water and the balance of surface-water and groundwater sources is a growing concern for this region. Alamogordo's current desalination proposal and Holloman AFB's improvements to the Bonito pipeline are part of continuing efforts to meet demands well into the future.

Auxiliary Airfields. In addition to use by the F-16 FTU, RIAC is used infrequently to support Joint Training Exercises (JTX, in the past, known as Roving Sands). Combined operations of the F-35A training operations, F-16 training operations, civilian and commercial operations, and temporary staging support for any future major exercise could have short-term effects at this site. This could cause some elevated noise levels surrounding the airfield and possibly extending to the outskirts of the city of Roswell residential areas. Air traffic control responsibilities would spike if all of these activities take place concurrently. Because JTX generally involves substantial on-the-ground planning and coordination, appropriate procedures and additional staff could be added to ease any potential workload and safety concerns (ground or air) during periods of peak operations.

Table HO 4.2–1. Past, Present, and Reasonably Foreseeable Actions at Holloman AFB and Associated Region

Action	*Proponent/ Location*	*Timeframe*	*Description*	*Resource Interaction*
Military Actions				
Environmental Assessment for Recapitalization of the 49th WG Combat Capabilities and Capacities, Holloman Air Force Base, New Mexico	Air Education and Training Command, Holloman AFB, Luke AFB	Present	Air Education and Training Command is implementing the relocation of the F-16 training mission from Luke AFB, Arizona, to Holloman AFB, New Mexico. The relocation of the F-16 training mission is expected to occur in FY2013.	Represented in baseline conditions.
Relocation of F-22 Operational Mission from Holloman AFB, New Mexico	Air Combat Command, Pacific Air Forces	Present	The Department of the Air Force proposed to consolidate the F-22 fleet by redistributing the two F-22 squadrons assigned to Holloman AFB to three bases: Joint Base Langley-Eustis, Virginia; Tyndall AFB, Florida; Joint Base Elmendorf-Richardson, Alaska.	Represented in baseline conditions.
Programmatic Environmental Assessment for Joint Training Exercise (JTX) Roving Sands	Headquarters, U.S. Army Forces Command/Joint Services, South Central NM	Past, future	Joint Air Force and Army large force exercise uses military training airspace and surface areas throughout south–central New Mexico. The exercise involves ground and airspace use at WSMR and Fort Bliss, New Mexico, and has included Holloman AFB-managed airspace and aircraft in the past. A variety of aircraft, including helicopters, may use restricted and military airspace during such an exercise. The exercise has been less frequent in recent years, and its future requirements and size are unknown. Areas of operation and activities during JTX Roving Sands could overlap with airspace for F-35A training at Holloman AFB.	Airspace Management and Use, Noise, Air Quality, Land Use and Recreation in training airspace and auxiliary airfields.
Environmental Assessment 49 Material Maintenance Group BEAR Base Improvements, Holloman AFB	Holloman AFB	Past	Construction and development of facilities around airfield (using approximately 92 acres of land), increased impervious surface on Holloman AFB.	Represented in baseline conditions at the installation.
Inactivation of 20th Fighter Squadron at Holloman AFB, New Mexico	Holloman AFB	Past	Squadron has been deactivated, with reduction in AT-38B aircraft and flight operations.	Represented in baseline conditions at the installation.
Environmental Assessment Wing Infrastructure Development Outlook Projects at Holloman Air Force Base, New Mexico	Air Combat Command, Holloman AFB	Past, present	Construction and physical improvements projects on Holloman AFB (completed), increased impervious surface on Holloman AFB.	Biological Resources, Infrastructure, Land Use and Recreation, Soil Resources, Water Resources.

Action	Proponent/ Location	Timeframe	Description	Resource Interaction
Military Actions (continued)				
Environmental Assessment Transforming the 49th Fighter Wing's Combat Capability	Air Combat Command, Holloman AFB	Past	Transformation of the 49th Fighter Wing, via the replacement of the F-117A (scheduled for retirement by the Air Force) and supporting T-38 aircraft with the beddown of two squadrons of F-22 aircraft. The proposed action required the renovation of existing facilities and the construction of new facilities to support F-22 activities.	Past mission.
Environmental Assessment Repair Bonito Pipeline, Otero and Lincoln Counties, New Mexico	Holloman AFB	Past, ongoing	Repairs to this 70-mile pipeline allowed Holloman AFB to utilize water from Bonito Lake to use its water rights and fulfill a portion of its potable water supply from this source.	Water Resources, Infrastructure.
Runway improvements to Stallion Army Airfield (AAF) on WSMR	Holloman AFB	Long-range future	Runway replacement and extension to the existing Stallion AAF on WSMR to improve the runway for use by fighter jets. Proposal also includes the addition of arresting cables and instrumentation. National Environmental Policy Act analysis has not been conducted but will be required.	Air Quality, Infrastructure, Soils and Water Resources, Hazardous Materials and Waste.
Other planned MILCON projects on Holloman AFB	Air Combat Command, Holloman AFB	Ongoing	Construction of a new parallel taxiway for Runway 07/25 near west ramp. Estimated 9 acres of disturbed area to be generated.	Soils and Water Resources, Safety.
AFSOC Assets Beddown at Cannon AFB, New Mexico Environmental Impact Statement	Air Force Special Operations Command (AFSOC), Cannon AFB	Past, ongoing	60 F-16 jets previously assigned to Cannon AFB were replaced by AFSOC turboprop aircraft (C-130s with varying missions, CV-22s, Predator Unmanned Aerial Systems, and additional aircraft). The flight operations at Cannon AFB were reduced approximately 40 percent including operations in the Pecos MOA.	Represented in baseline conditions.
Fort Bliss, Texas and New Mexico, Mission and Master Plan Supplemental Programmatic Environmental Impact Statement	U.S. Army Air Defense Artillery Center and Fort Bliss	Ongoing, future	Mission and Master Plan Supplemental EIS included a land use change in the Main Cantonment Area to support units assigned to Fort Bliss under BRAC, and in the Fort Bliss Training Complex to support construction of live fire ranges and for other training purposes. Approved the use of 352,000 acres in the Tularosa Basin portion of McGregor Range for off-road maneuver training. Expanded training missions use R-5103 airspace and approved development of new air-to-ground Centennial Range. Associated changes in personnel represent significant increases in population in the El Paso metropolitan area.	Air Quality, Cultural Resources, Land Use and Recreation, Noise, Water Resources.

Action	Proponent/ Location	Timeframe	Description	Resource Interaction
Military Actions (continued)				
New Mexico Training Range Initiative (NMTRI) Final Environmental Impact Statement	Air Force Special Operations Command, Cannon AFB	Past, ongoing	NMTRI modified configuration of existing airspace, creating new airspace, authorized supersonic flight above 10,000 feet MSL within the airspace (or about 5,000 to 6,000 feet AGL), and expanded the use of defensive countermeasures (chaff and flares) in new/modified airspace. Expanded size, operational altitudes, and usefulness of the Pecos MOAs and associated ATCAAs.	Airspace Management and Use, Noise.
Army Growth and Force Structure Realignment EIS	U.S. Army Fort Bliss	Future	Expanded ground training for Stryker wheeled brigade and Infantry brigade operations on Fort Bliss and McGregor Range, with associated training operations and field training sites with new sites in Sacramento Mountains and Otero Mesa on McGregor Range, and development within main cantonment. Land use changes allow for dismounted training in the northern part of the range in the Sacramento Mountains. Expansion of range camps and new temporary contingency operating locations throughout Tularosa Basin portions of Fort Bliss. Additional increases in soldiers and dependents at Fort Bliss residing on post and in El Paso area. Potential new railroad would align with U.S. Route 54, linking Fort Bliss to range camps.	Noise, Air Quality, Land Use and Recreation, and Socioeconomics.
Final EIS for Development and Implementation of Range-Wide Mission and Major Capabilities at WSMR, New Mexico	U.S. Army, White Sands Missile Range	Ongoing, future	Augmented existing capabilities for testing and training missions. Approved changes in land use to support off-road operations for Heavy Brigade Combat Team-sized unit at WSMR in the future, and provides for the expansion of the Main Post area as well as several of the Range Centers. Considered increase in test mission operations including directed energy weapons. Operations overlap with R-5107 airspace.	Air Quality, Airspace Management and Use, Biological Resources, Cultural Resources, Hazardous Materials and Waste, Land Use and Recreation, Noise, Safety, Soil Resources, Transportation, Water Resources.
Environmental Assessment for the MQ-1 Predator and MQ-9 Reaper Unmanned Aircraft System Second Formal Training Unit Beddown	Air Combat Command, Holloman AFB	Ongoing, future	Beddown of multiple squadrons of UAS (38 total aircraft and approximately 600 personnel) at Holloman AFB with approximately 2,900 sorties per year using WSMR's R-5107, R-5109, and R-5111.	Considered in baseline conditions for noise analysis. Airspace Management and Use, Air Quality, Biological Resources, Cultural Resources, Transportation.

Action	*Proponent/ Location*	*Timeframe*	*Description*	*Resource Interaction*
Non-Military Federal				
Resource Management Plan Amendment and EIS for McGregor Range at Fort Bliss	BLM Las Cruces Field Office	Ongoing, future	Resource Management Plan Amendment and EIS to address the management of public land within the boundaries of McGregor Range in southern Otero County, New Mexico.	Biological Resources, Land Use and Recreation, Soil Resources, Water Resources.
Plan revision and Resource Management Plan/EIS for areas of Otero, Sierra, and Doña Ana counties in New Mexico	BLM Las Cruces Field Office	Ongoing, future	Revision of 1986 White Sands Resource Management Plan, an amendment to 1993 Mimbres Resource Management Plan, and EIS for management of public lands in tri-county area.	Biological Resources, Land Use and Recreation, Water Resources.
Final Rule for Northern Aplomado Falcon in New Mexico	USFWS	Ongoing	The northern aplomado falcon is designated as endangered in New Mexico and could occur within the airspace to be used F-35A training. A final rule was published in the *Federal Register* on July 26, 2006, establishing an experimental/nonessential population in Arizona and New Mexico under Section 10(j) of the Endangered Species Act. Reintroduction of the falcon (initiated in July 2007) is jointly managed by the State of New Mexico, USFWS, BLM, DoD, and other private agencies.	Biological Resources – represented in baseline conditions and ongoing management.
State and Local				
Alamogordo Regional Water Supply Project Draft Environmental Impact Statement	City of Alamogordo	Ongoing, future	Alamogordo Regional Water Supply Project desalination proposal to treat new water sources being developed for the city. The proposal would treat brackish water drawn from a proposed well field using water from the Tularosa Basin aquifer.	Water Resources.
Spaceport America	New Mexico State Land Office	Present, future	New Mexico State Land Office has signed an agreement for the development of Spaceport America on 15,000 acres of state trust lands near Upham, New Mexico, approximately 40 miles west of Holloman AFB and 40 miles north of Las Cruces, New Mexico, under R-5111. Construction began in 2009 and completion scheduled for December 2010. Flight operations associated with the Spaceport could potentially overlap with portions of restricted airspace proposed for F-35A training.	Airspace Management and Use.

Recent development of roads and Heavy Brigade Combat Team enclaves in the vicinity Biggs AAF and EPIA have contributed to higher human activity and traffic in and around these airfields. The addition of two CABs at Biggs AAF has increased operations, primarily by helicopters, in and out of Biggs AAF. Unlike fixed-wing aircraft, flight tracks for rotary-wing vehicles can depart the airfield without flying over residential areas located to the southwest of the runway. Most of the arriving air traffic to both airfields is routed over Fort Bliss and avoids overflight of surrounding residential areas. Increased operations by F-35A aircraft performing patterns at either airfield would cause additional noise, affecting residential areas to the southwest of both airfields in the city of El Paso and new troop housing east of Biggs AAF.

Training Airspace. Primary use training airspace identified for the F-35A mission has supported military missions for units at Holloman AFB, WSMR, and Fort Bliss; joint exercises; and transient military users for decades. Combinations of users have resulted in variations in the utilization of MOAs, MTRs, and restricted airspace over time. The F-35A proposals, in combination with ongoing and evolving operations at regional installations, could cause higher-than-usual noise levels in some underlying areas (as described in resource sections of this EIS). This could cumulatively affect recreational sites and sensitive land uses (described in the EIS analysis) and isolated homesteads throughout the region. For example, the Pecos MOA has undergone recent changes in altitude structure and size, coupled with changes in utilization and aircraft types by units at Holloman AFB, which could result in variations in utilization and noise.

Increasing projections for all of these installations, if realized, could result in increasingly complex scheduling and airspace management challenges. Cumulative use of R-5107 for WSMR testing purposes (with expanding safety volumes for directed energy weapons tests), projected increase in use of restricted airspace for remotely piloted aircraft, and the increasing use for training purposes will place considerable pressure on scheduling and airspace management to maintain safe operating conditions. Releasing restricted airspace back to FAA for civilian transit may also become less frequent. To address this trend, more-centralized scheduling and air traffic control for the Fort Bliss, Holloman, and White Sands airspace complex is under consideration.

R-5103 overlying McGregor and Centennial Range would experience increased use under the F-35A scenarios. Additional surface activities for infantry training and placement of new field training sites add to the overall level of activity affecting Otero Mesa. This area is highly valued for its natural setting and unique grassland habitat. More-constrained public access to this area, coupled with higher noise levels, could degrade the qualities of this area that have regional ecological and recreational importance.

HO 4.3 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For the beddown of F-35A aircraft at Holloman AFB, most resource commitments are neither irreversible nor irretrievable. Most impacts are short term and temporary, such as air emissions from construction, or longer lasting but negligible, such as public service increases. Increases in sonic booms would not be negligible. However, the duration of individual booms would be extremely brief. Those limited resources that may involve a possible irreversible or irretrievable commitment are discussed below.

If Holloman AFB is the chosen beddown location, some land on the west side of the airfield would be disturbed. Much of this land has been previously disturbed and is heavily influenced by airfield development. Construction and renovation of base facilities would require the consumption of limited amounts of material typically associated with interior renovations (wiring, insulation, windows, and drywall) and exterior construction (concrete, steel, sand, and brick). An undetermined amount of energy to conduct renovation, construction, and operation of these facilities would be expended and irreversibly lost.

Training operations would continue and would involve consumption of nonrenewable resources, such as gasoline used in vehicles and jet fuel used in aircraft. Use of training ordnance would involve continued commitment of defensive countermeasures. None of these activities are expected to significantly decrease the availability of minerals or petroleum resources. Personal vehicle use by the personnel continuing to support the existing missions would consume fuel, oil, and lubricants. The amount of these materials used would increase slightly; however, this additional use is not expected to significantly affect the availability of the resources.

Alternative

Luke AFB

You are in the Luke AFB section.
This page is intended to help you find specific information about Luke AFB and to clarify this section's relation to the rest of the EIS.

Overall Proposal

Table of Contents, List of Figures, List of Tables, and Acronyms and Abbreviations

Preface: Detailed Guide for Reading the EIS → Go back to the Preface for a detailed guide for reading the EIS.

Chapter 1: Purpose and Need for F-35A Training Basing → Go back to Chapter 1 for an explanation of the decision made by Congress to provide the U.S. Air Force with a next-generation fighter. Also described are the features of the F-35A, how the F-35A will be based, and how aircrews will train for their operational assignments.

Chapter 2:
- Overview of Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of Proposed Action and Alternatives

→ Go back to Chapter 2 for an overview of the Proposed Action and alternatives, which is to beddown the F-35A at Boise AGS, Holloman AFB, Luke AFB, and/or Tucson AGS.

Chapter 3: Resource Definition and Methodology for Analysis → Go back to Chapter 3 for a definition of the environmental resources that could potentially be affected by the Proposed Action and an explanation of the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base-Specific Information

BO-Boise AGS Alternative — See Boise AGS Section

HO-Holloman AFB Alternative — See Holloman AFB Section

LU-Luke AFB Alternative

TU-Tucson AGS Alternative — See Tucson AGS Section

Section LU 1.0
Introduction

Section LU 2.0
Detailed Description of Action

Section LU 3.0
Affected Environment and Environmental Consequences

Aircraft Operations
LU 3.1 Airspace Management and Use
LU 3.2 Noise
LU 3.3 Air Quality
LU 3.4 Safety

Natural Resources
LU 3.5 Soils and Water
LU 3.6 Vegetation and Wildlife
LU 3.7 Wetlands and Aquatic Communities
LU 3.8 Threatened, Endangered, and Special Status Species

Cultural and Traditional Resources
LU 3.9 Cultural Resources

Human Resources
LU 3.10 Land Use and Recreation
LU 3.11 Socioeconomics
LU 3.12 Environmental Justice and Protection of Children

Community and Infrastructure
LU 3.13 Infrastructure
LU 3.14 Transportation
LU 3.15 Hazardous Materials and Waste

Section LU 4.0
Cumulative Effects and Irreversible and Irretrievable Commitment of Resources

This section of the EIS presents site-specific and resource-specific details on the existing environmental conditions of Luke AFB. It also describes the potential environmental consequences of the proposed beddown of the F-35As at the base.

A summary of public and agency comments received during scoping is included in Section LU 2.2.3.

Comments received during the public review period of the Draft EIS, as well as Air Force responses, are included in Appendix D.

Overall Proposal

References	List of Preparers	Index	List of Repositories	Glossary	Appendices A, B, and C
Volume 1	Volume 1	Volume 1	Volume 1	Volume 1	Volume 2

DEIS Comments

Appendix D, D.1, D.2, and D.3	Appendix D, D.4 and D.5	Appendix D, D.6, D.7, D.8, and D.9	Appendix D, D.10
Receipt and Locating Comments	Alphabetical Directory	Copies of Letters and Transcripts	Response to Comments
Volume 2	Volume 2	Volume 2	Volume 2

LU 1.0 Luke AFB Overview

This section of Chapter 4 presents the operational and environmental factors specific to Luke Air Force Base (Luke AFB). Section LU 2.0 explains that six scenarios are being considered for Luke AFB, comprising Scenario L1, with a beddown 24 Primary Aircraft Authorized (PAA), Scenario L2 with 48 PAA, Scenario L3 with 72 PAA, Scenario L4 with 96 PAA, Scenario L5 with 120 PAA, and Scenario L6 with 144 PAA, and describes the specific actions at Luke AFB that would be required for the beddown under each scenario. Scenario L3 with 72 PAA is the U.S. Air Force's (Air Force's) Preferred Alternative.

The environmental resources at Luke AFB, as well as under its airspace would be affected by the basing of the F-35A Pilot Training Center (PTC). These resources and the potential consequences are discussed in Section LU 3.0. Section LU 4.0 describes the cumulative actions and consequences and the irreversible and irretrievable commitment of resources that would be associated with a basing decision at Luke AFB. Figure LU 1.0–1 shows the location of Luke AFB and surrounding communities.

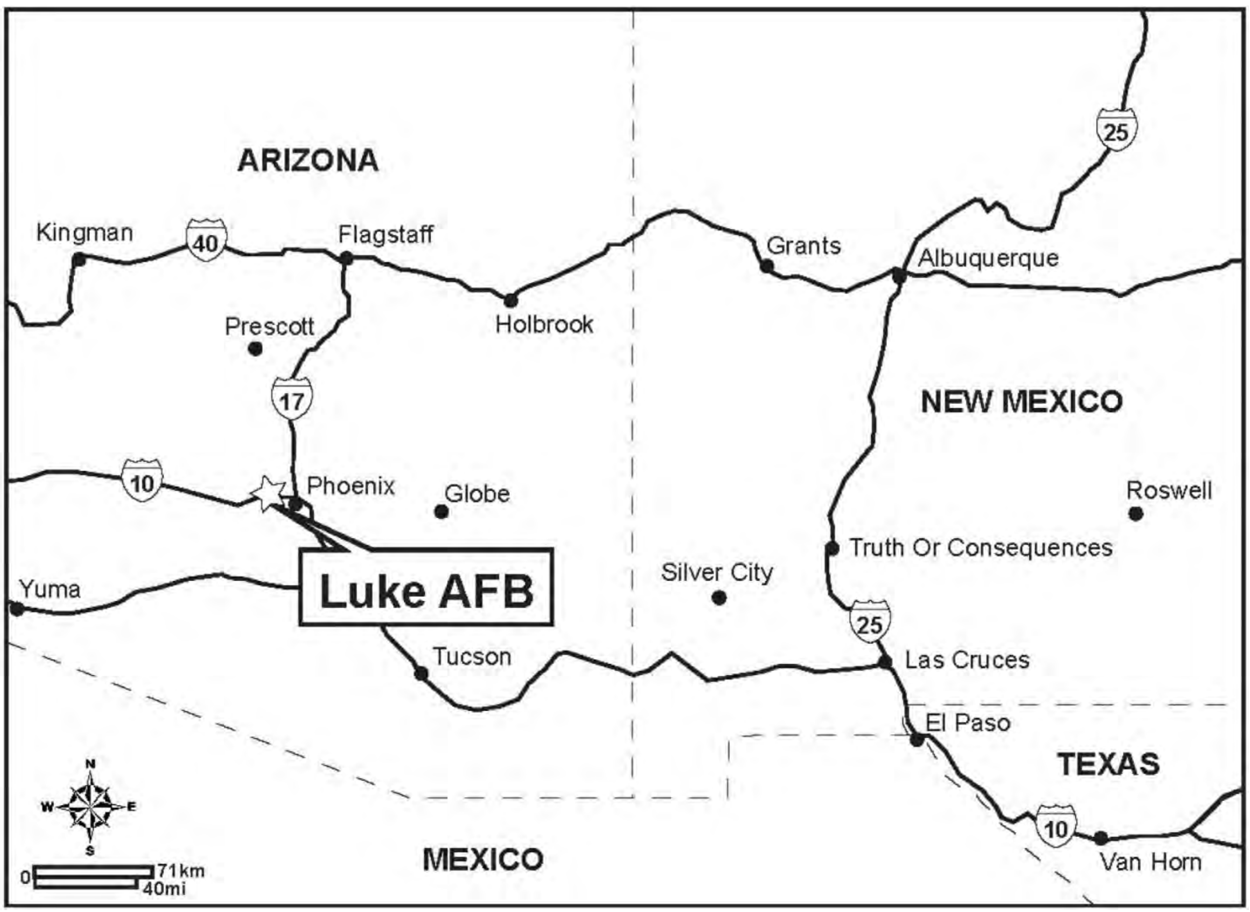


Figure LU 1.0–1. Vicinity of Luke AFB, Arizona

LU 2.0 Luke AFB Alternative (Scenarios L1, L2, L3, L4, L5, and L6)

This section details the actions that would occur at Luke AFB, Arizona, and in the associated training airspace if Luke AFB were selected for the basing of an F-35A PTC.

Luke AFB was evaluated by the Air Force for the potential to beddown up to 144 F-35A PAA. The Air Force determined Luke AFB's infrastructure and base resources would accommodate up to 144 F-35A PAA within the constraints set by the alternative narrowing process described in Section 2.2.2. This results in six F-35A beddown scenarios for planning in this Environmental Impact Statement (EIS): Scenario L1 (24 aircraft), Scenario L2 (48 aircraft), Scenario L3 (72 aircraft), Scenario L4 (96 aircraft), Scenario L5 (120 aircraft), and Scenario L6 (144 aircraft), as shown in Table LU 2.0–1. Some of the F-16s currently stationed at Luke AFB are programmed for retirement, while the remaining F-16 training squadrons are being relocated to Holloman AFB. For the purposes of this EIS, two F-16 Foreign Military Sales (FMS) squadrons with 26 aircraft are assumed to remain at Luke AFB under any of the F-35A beddown scenarios. For planning purposes, the Luke AFB No Action Alternative assumes continuation of an F-16 training mission. As described in Chapter 2, Section 2.5, the No Action Alternative for Luke AFB constitutes the baseline conditions.

Table LU 2.0–1. Luke AFB F-35A Aircraft Scenarios

Aircraft Scenario	*F-16 PAA*	*F-35A PAA*	*Total PAA at Luke AFB*
Baseline Conditions	168	0	168
Scenario L1 (24 Aircraft)	26	24	50
Scenario L2 (48 Aircraft)	26	48	74
Scenario L3 (72 Aircraft)	26	72	98
Scenario L4 (96 Aircraft)	26	96	122
Scenario L5 (120 Aircraft)	26	120	146
Scenario L6 (144 Aircraft)	26	144	170

LU 2.1 Luke AFB: Base

Three elements of this alternative have the potential to affect Luke AFB and its immediate vicinity. These three elements are (1) airfield operations, (2) construction/renovation of facilities, and (3) personnel changes. Each is described in detail below. This EIS evaluates the environmental consequences of the beddown of F-35A aircraft under each aircraft scenario.

LU 2.1.1 Airfield Operations

Table LU 2.1–1 provides the number of annual airfield operations anticipated with the beddown of the F-35A training mission at Luke AFB by each aircraft scenario. The 56th Fighter Wing (56 FW), based at Luke AFB, operates 168 F-16 aircraft under baseline conditions following a reduction from 205 F-16s as a result of the 2005 Defense Base Realignment and Closure (BRAC) recommendation. Two of the F-16 squadrons in the 56 FW are FMS squadrons operating a combined 26 F-16 aircraft. While the

> ***Airfield operations*** are categorized as takeoffs, landings, closed patterns (including activities referred to as "touch-and-go operations," "go-arounds," or "low approaches"), or inter-facility transfers.

26 F-16 aircraft with the FMS squadrons are projected to remain, the F-16 aircraft assigned to the 56 FW would retire or relocate from Luke AFB under all beddown scenarios. When combined with the loss of the Air Force F-16 sorties, the total number of airfield operations conducted at Luke AFB would decrease under five of the six beddown scenarios. Under Scenarios L1, L2, L3, L4, and L5, the net total airfield operations at Luke AFB would decrease by 65, 50, 35, 20, and 5 percent, respectively. Under Scenario L6, the net change in airfield operations would be positive, with the total number increasing by 9.6 percent.

Table LU 2.1–1. Luke AFB Baseline and Projected Annual Airfield Operations

	Baseline Annual Airfield Operations[1]	*Projected Annual F-35A Airfield Operations*					
		Scenario L1 (24 Aircraft)	**Scenario L2 (48 Aircraft)**	**Scenario L3 (72 Aircraft)**	**Scenario L4 (96 Aircraft)**	**Scenario L5 (120 Aircraft)**	**Scenario L6 (144 Aircraft)**
F-35A	0	12,662	25,342	37,986	50,648	63,310	75,972
F-16	82,393	16,364	16,364	16,364	16,364	16,364	16,364
Transient[2]	2,820	1,097	1,097	1,097	1,097	1,097	1,097
Total	**85,213**	**30,123**	**42,803**	**55,447**	**68,109**	**80,771**	**93,433**

[1] Luke AFB 2007a.
[2] Transient aircraft include A-10, C-130, C-21, C-5, F-15, F-18, T-1, C-135, and C-130.

The percentage of F-35A departures expected to use afterburner has been adjusted from the generalized percentage shown in Chapter 2, Table 2–6, based on local flying conditions such as airfield elevation and runway length. At Luke AFB, 7 training events in the F-35A training syllabus have the potential for the use of afterburners during takeoff. As the training syllabus consists of 58 total training events, approximately 12 percent of all F-35A departures would be required to use afterburner to fulfill the training syllabus.

Of the 58 training events in the F-35A training syllabus, 10 have the potential for after-dark flights, constituting approximately 17 percent of the sorties under each aircraft scenario. Under Scenarios L1 and L2, all after-dark flights are expected to return prior to 10:00 p.m. However, based on examination of recorded landing times at Luke AFB and projections of scheduling issues, it is expected that under Scenarios L3 and L4, F-35A sorties would occasionally land after 10:00 p.m. (less than 1 percent of total F-35A sorties). Under Scenarios L5 and L6, 2 percent of total F-35A sorties would land after 10:00 p.m. Aircraft operations conducted during "environmental night" (10:00 p.m. to 7:00 a.m.) are assigned an additional noise penalty of 10 decibels (dB) in calculation of certain noise metrics to account for low ambient noise levels and the increased potential for sleep disturbance.

The F-35A would employ similar departure, closed patterns, and landing procedures as currently used by Luke AFB aircraft. F-35A operations would adhere to existing restrictions and avoidance procedures.

LU 2.1.2 Construction

Additional facilities and infrastructure would be required at Luke AFB to support F-35A training operations. Table LU 2.1–2 lists the F-35A-related construction, demolition, and renovation projects required for each aircraft scenario. Construction, demolition, and renovation of facilities would take place within the previously disturbed cantonment area of the military installation (see Figure LU 2.1–1).

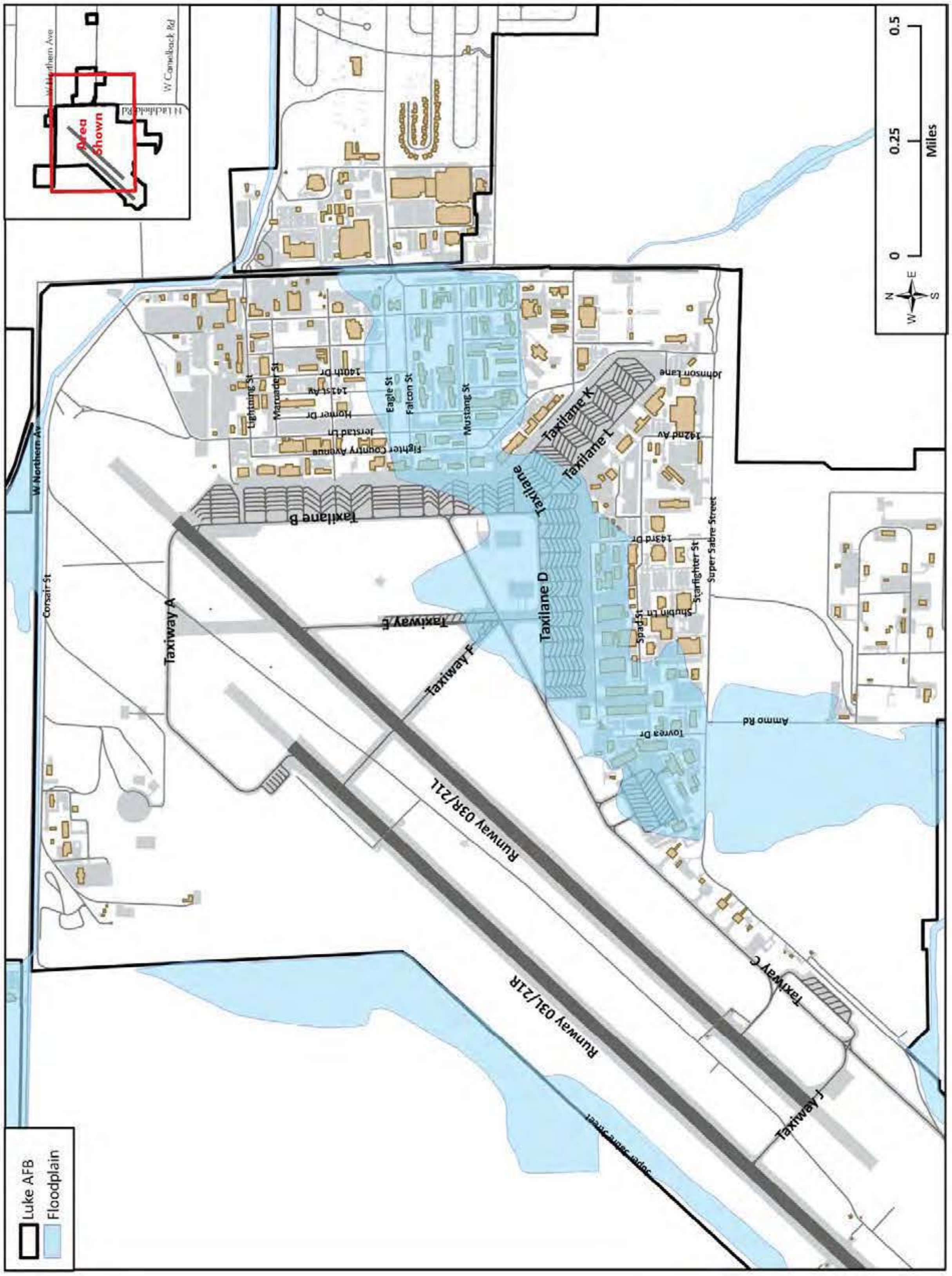


Figure LU 2.1–1. Luke AFB F-35A Construction Area

The total disturbed area presented in Table LU 2.1–2 comprises the total area covered by the construction footprints of the proposed facilities, plus an estimate of the surrounding lands where construction-related clearing and grading would occur. Construction activities are expected to begin in fiscal year (FY) 2012 and be complete by FY2014, when the first F-35A is expected to be bedded down. Some of the pavements and airfield surfaces may need to be upgraded.

Table LU 2.1–2. F-35A Construction at Luke AFB Under Each Aircraft Scenario

Project	*No. of Aircraft*[1]	*Renovate*	*New/ Addition*	*Total Disturbed Area (square feet)*[2]
Construct New Squadron Operations, Squadron 1	24		X	24,200
Add/Alter AMU (Bldg 460)	24	X	X	18,150
Security Fence	24		X	189,244
Field Training Detachment	24	X	X	6,600
Repair AGE North (Storage Yard 16,000/ Bldg 20,000)	24	X		39,600
Upgrade Hangar	24	X		27,885
Add/Alter Wheel & Tire	24	X	X	9,680
Upgrade Hangar (Weapon Load Training)	24	X		35,475
Upgrade Simulator	24	X		33,400
Upgrade Battery Shop/Hangar	24	X		2,200
Upgrade Paint Facility (Bldg 922)	24	X		22,693
Upgrade Module Repair (Bldg 930)	24	X		45,705
Sheet Metal (F-35A Composite Repair)	24	X		1,452
Upgrade Phase Dock	24	X		27,500
Upgrade Fuel Cell for NC area (2 bay) (currently alt fuel barn)	24	X		16,917
Add/Alter Egress Shop	24	X	X	3,960
Upgrade Propulsion Facility	24	X	X	
Apron Re-stripe, phase 1 (48 aircraft)	24	X		N/A
Construct Vault	24	X	X	
Replace Pavement Taxiways J and F	24	X		0
Renovate 56 OSS, Bldg 958	24	X		11,000
Base Infrastructure Upgrade	24		X	0
Pilot Fitting Facility	24		X	4,470
Title V permit update	24	X		N/A
Construct New Squadron Operations/ AMU, Squadron 2	48		X	52,360
Fuel Cell for SC area	48		X	2,200
Add/Alter Hangar	48	X	X	27,500
Add/Alter Hangar No. 3	48	X	X	
Construct New Squadron Operations/ AMU, Squadron 3	72		X	52,360
Apron Re-stripe, phase 2 (48 aircraft)	72	X		N/A
Controlled Movement Area	72		X	0

Project	*No. of Aircraft*[1]	*Renovate*	*New/ Addition*	*Total Disturbed Area (square feet)*[2]
Security requirement, alarm monitoring expansion	72		X	0
Construct Flightline Fillstands	72		X	0
Relocate Wash Rack	72	X	X	0
Earthen Berm for hung gun	72		X	0
Vertical Storage Facility	72		X	0
Bulk Fuel Storage	96		X	44,000
Add/Alter Hangar (structures)	96	X	X	24,200
Squadron Operations No. 4	96		X	24,200
Add/Alter Hangar	96	X	X	27,500
Squadron Operations No. 5	120		X	24,200
Apron Re-stripe, phase 3 (48 aircraft)	120	X		N/A
Add/Alter Hangar	120	X	X	27,500
Squadron Operations No. 6	144		X	24,200
Add/Alter Hangar	144	X	X	27,500
AGE SW	144	X		2,200
Fuel Cell for SW area	144	X		5,500
Add/Alter Hangar	144	X	X	22,000
Academic Training Facility	24, 48, 72, 96, 120, 144		X	159,500
Total for Scenario L1 (24 Aircraft)				**679,631**
Total for Scenario L2 (48 Aircraft)				**761,691**
Total for Scenario L3 (72 Aircraft)				**814,051**
Total for Scenario L4 (96 Aircraft)				**933,951**
Total for Scenario L5 (120 Aircraft)				**985,651**
Total for Scenario L6 (144 Aircraft)				**1,067,051**

[1] Construction for aircraft scenarios is additive, i.e., construction required for 72 aircraft includes all proposed construction under 24, 48, and 72 aircraft.

[2] Total disturbed area is estimated to be 10 percent larger than the footprint of the finished facility as a best engineering estimate to account for disturbance by construction activities, including laydown areas and utility connections.

Key: AGE=aerospace ground equipment; AMU=Aircraft Maintenance Unit.

Renovations would be required for the existing facilities and facilities vacated by the departing F-16 squadrons to meet the security and space requirements for the F-35A. The beddown of 48 or more aircraft would require additional construction for squadron operations, maintenance, and hangars. Construction of new academic training facilities, including simulators, additional hangar bays, and corrosion control bays, and squadron operations would be required.

LU 2.1.3 Personnel Changes

Beddown of the F-35A training mission would also require basing and appropriately skilled personnel sufficient to operate and maintain the wing and provide necessary support services. Each aircraft scenario has a different manpower requirement. Under Scenario L1, manpower

associated with the F-16 training mission would begin to depart as the F-35A training mission is bedded down (see Table LU 2.1–3). Under Scenario L6, the only F-16 mission remaining would be the two FMS squadrons.

Table LU 2.1–3. Luke AFB F-35A Training Mission Personnel and Dependent Changes

F-35A Scenario (No. of Aircraft)	F-16 Mission Personnel[1]	Other Base Personnel	F-35A Personnel	F-35A Contractors	F-35A Students[2]	Total Base Personnel	Net Change in Personnel	Depen-dents[3]	Total Base Population	Net Change
Baseline Conditions	1,907	4,935	–	–	–	6,842	N/A	9,821	16,663	N/A
Scenario L1 (24)	–	4,935	1,449	50	30	6,464	(378)	8,923	15,387	(1,276)
Scenario L2 (48)	–	4,935	1,959	50	60	7,004	162	10,045	17,049	386
Scenario L3 (72)	–	4,935	2,470	50	90	7,545	703	11,170	18,715	2,052
Scenario L4 (96)	–	4,935	2,980	50	120	8,085	1,243	12,292	20,377	3,714
Scenario L5 (120)	–	4,935	3,490	50	150	8,625	1,783	13,414	22,039	5,376
Scenario L6 (144)	–	4,935	4,001	50	180	9,166	2,324	14,538	23,704	7,041

[1] F-16 mission personnel only.
[2] The Air Force assumes F-35A students would be unaccompanied by dependents.
[3] The Air Force assumes 2.2 dependents per military member.
Note: (Number) indicates a negative number.
Key: BOS=Base operating support.

LU 2.2 Luke AFB: Airspace and Ranges

As a replacement and supplement to the F-16 aircraft at Luke AFB and the A-10 aircraft at Davis-Monthan AFB, the F-35A would conduct missions and training programs similar to both aircraft (see Chapter 2). This would include air-to-air and air-to-ground training. The Air Force expects that the F-35A would operate primarily in the airspace associated with Luke AFB, nearby Gila Bend Air Force Auxiliary Field (Gila Bend AFAF) and Luke AFB Auxiliary Airfield 1 (Aux-1), and the designated primary use airspace units in a manner similar to the F-16 squadrons from Luke AFB and Tucson International Airport Air Guard Station (Tucson AGS), as well as the A-10s from Davis-Monthan AFB, which currently use that airspace. All F-35A flight training activities would take place in existing airspace; therefore, no airspace modifications would be required.

LU 2.2.1 Airspace and Auxiliary Airfield Use

Airspace

Figure LU 2.2–1 shows the primary Special Use Airspace (SUA) and Airspace for Special Use (ASU) the F-35A would use for flight training. Table LU 2.2–1 and Table LU 2.2–2 list annual sortie-operations counts under baseline conditions and projected annual sortie-operations under Scenarios L1 through L6. F-35A aircraft would use other SUA units on an occasional basis, typically when primary airspace units are not available due to inclement weather or scheduling conflicts. Each of the primary use Military Operations Areas (MOAs) have overlying Air Traffic Control Assigned Airspace (ATCAAs) to provide the higher altitudes needed for flight maneuvers above the MOA ceilings. The Gladden, Bagdad, and Sells MOAs/ATCAAs and Restricted Area 2301E (R-2301E) and R-2304/R-2305 are scheduled and managed by the 56 FW (see Table LU 2.2–1).

A ***sortie-operation*** is the use of one airspace unit by one aircraft.

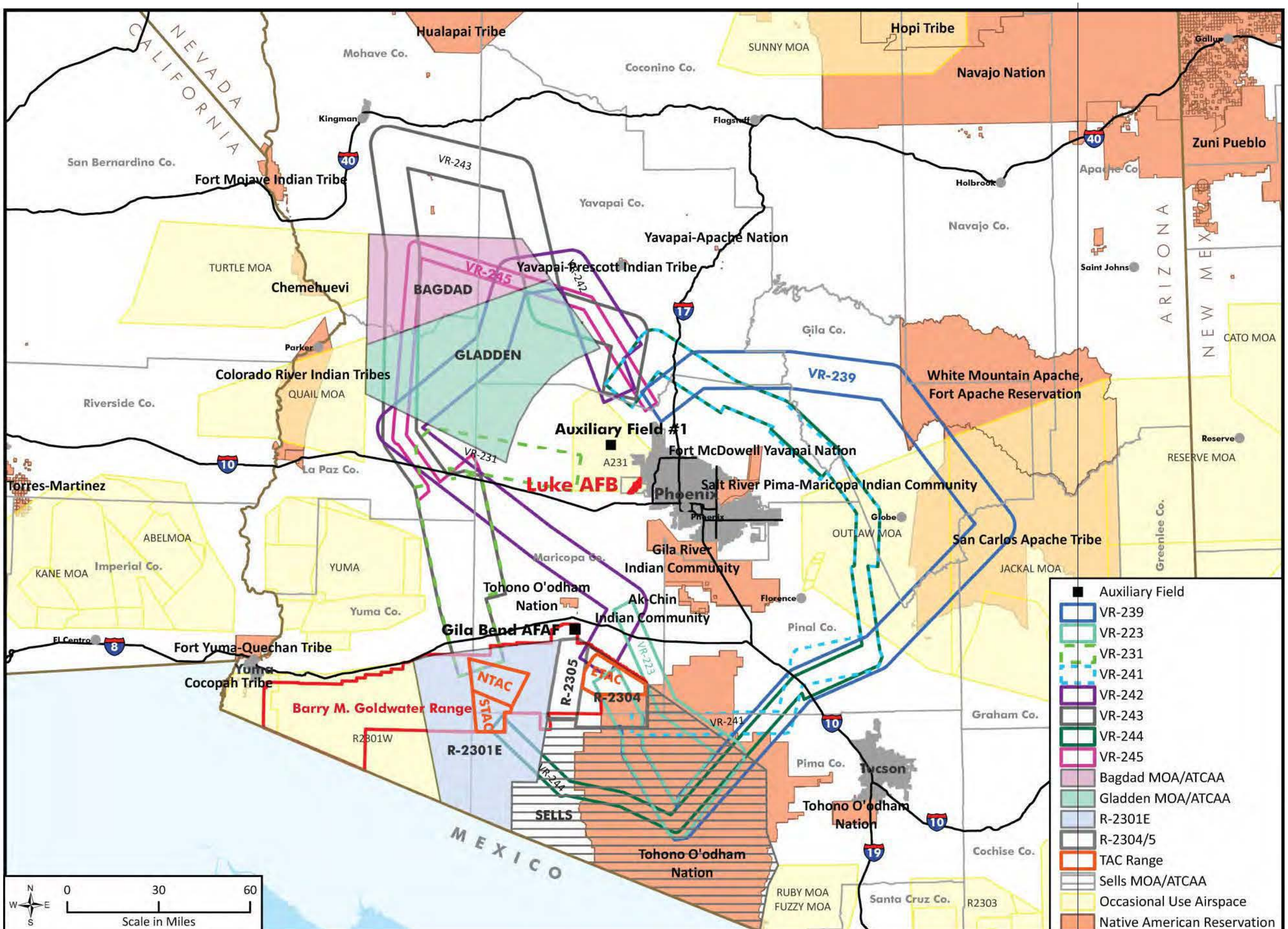


Figure LU 2.2–1. Airspace and Ranges for the F-35A Beddown at Luke AFB, Arizona

The ATCAAs overlying primary use MOAs are scheduled by the Albuquerque Air Route Traffic Control Center (ARTCC). Cooperative scheduling of this airspace by the 56 FW and Albuquerque ARTCC has ensured the needs of all airspace users are accommodated. In addition to the F-16s based at Luke AFB, primary daily users of these airspace units include F-16s located at Tucson AGS (to include Air Force Reserve Command [AFRC] Test Center F-16/A-10 aircraft); Snowbird Operations, which hosts various units and aircraft based out of Davis-Monthan AFB; A-10s, C-130s, and HH-60s from Davis-Monthan AFB; and Army Guard helicopters out of Silverbell Army Airfield. Casual daily users (i.e., users not given first priority during scheduling) are F-5s, AV-8s, and F-18s out of Marine Corps Air Station (MCAS) Yuma and MCAS Miramar. Transient users include B-52s, B-1s, C-130s, KC-135s, KC-10s, EA-6s, and AV-8s. In addition to MOAs, ATCAAs, and Restricted Areas, low-level Military Training Routes (MTRs) would be used in F-35A training events. Table LU 2.2–2 lists the MTRs to be used by the F-35A.

Table LU 2.2–1. Projected F-35A Airspace Use at Luke AFB

Special Use Airspace	*Supersonic Authorized?*	*Aircraft Type*[1]	*Baseline Annual Sortie-Operations*[2]	*Projected Annual F-35A Sortie-Operations*					
				Scenario L1 (24 Aircraft)	Scenario L2 (48 Aircraft)	Scenario L3 (72 Aircraft)	Scenario L4 (96 Aircraft)	Scenario L5 (120 Aircraft)	Scenario L6 (144 Aircraft)
MOAs/ATCAAs									
Gladden/ Bagdad MOA/ATCAA Complex	Yes, above 10,000 feet MSL	F-35A	0	2,870	5,470	8,610	11,480	14,350	17,220
		F-16	9,527	1,474	1,474	1,474	1,474	1,474	1,474
		Other military	42	42	42	42	42	42	42
		Total	**9,569**	**4,386**	**6,986**	**10,126**	**12,996**	**15,866**	**18,736**
Sells MOA/ ATCAA	Yes, above 10,000 feet MSL	F-35A	0	1,325	2,651	3,976	5,301	6,626	7,952
		F-16	8,321	2,899	2,899	2,899	2,899	2,899	2,899
		Other military	3,047	3,047	3,047	3,047	3,047	3,047	3,047
		Total	**11,368**	**7,271**	**8,597**	**9,922**	**11,247**	**12,572**	**13,898**
Restricted Areas									
R-2301E - Air-to-Air Area	Yes, above 5,000 feet AGL	F-35A	0	616	1,232	1,849	2,465	3,081	3,697
		F-16	10,397	3,622	3,622	3,622	3,622	3,622	3,622
		Other military	1,505	1,505	1,505	1,505	1,505	1,505	1,505
		Total	**11,902**	**5,743**	**6,359**	**6,976**	**7,592**	**8,208**	**8,824**
R-2301E-North TAC/South TAC Ranges	Yes, above 5,000 feet AGL	F-35A	0	675	1,351	2,026	2,701	3,377	4,052
		F-16	16,342	5,694	5,694	5,694	5,694	5,694	5,694
		Other military	4,888	4,888	4,888	4,888	4,888	4,888	4,888
		Total	**21,230**	**11,257**	**11,933**	**12,608**	**13,283**	**13,959**	**14,634**
R-2304/ R-2305 - East TAC Range	No	F-35A	0	675	1,351	2,026	2,701	3,377	4,052
		F-16	7,014	2,444	2,444	2,444	2,444	2,444	2,444
		Other military	2,675	2,675	2,675	2,675	2,675	2,675	2,675
		Total	**9,689**	**5,794**	**6,470**	**7,145**	**7,820**	**8,496**	**9,171**

[1] Aircraft types presented are representative of aircraft types operating in the airspace.
[2] Sortie-operations counts include all aircraft activity, including aircraft types such as AV-8, F-5, and various transient users.
Key: MSL=mean sea level.

Table LU 2.2–2. Projected F-35A MTR Use at Luke AFB

MTR	Min/Max Altitudes	Min/Max Width	Aircraft Type[1]	Baseline Annual Sortie-Operations	Projected Annual F-35A Sortie-Operations					
					Scenario L1 (24 Aircraft)	Scenario L2 (48 Aircraft)	Scenario L3 (72 Aircraft)	Scenario L4 (96 Aircraft)	Scenario L5 (120 Aircraft)	Scenario L6 (144 Aircraft)
VR-239	300 feet AGL to 9,500 feet MSL	3–5 NM either side of centerline	F-35A	0	52	104	156	208	260	312
			F-16	272	42	42	42	42	42	42
			Total	**272**	**94**	**146**	**198**	**250**	**302**	**354**
VR-245	300 feet AGL to 9,000 feet MSL	1.5–14 NM either side of centerline	F-35A	0	52	104	156	208	260	312
			F-16	99	15	15	15	15	15	15
			Total	**99**	**67**	**119**	**171**	**223**	**275**	**327**
VR-223	500 feet AGL to 9,000 feet MSL	3–4 NM either side of centerline	F-35A	0	26	52	78	104	130	156
			F-16	1,021	158	158	158	158	158	158
			Total	**1,021**	**184**	**210**	**236**	**262**	**288**	**314**
VR-231	100 feet AGL to 7,000 feet MSL	4–8 NM right and 5–14 NM left side of centerline	F-35A	0	26	52	78	104	130	156
			F-16	918	142	142	142	142	142	142
			Total	**918**	**168**	**194**	**220**	**246**	**272**	**298**
VR-241	300 feet AGL to 9,500 feet MSL	2–5 NM either side of centerline	F-35A	0	3	6	9	12	15	18
			F-16	99	15	15	15	15	15	15
			Total	**99**	**18**	**21**	**24**	**27**	**30**	**33**
VR-242	300 feet AGL to 9,000 feet MSL	5 NM either side of centerline	F-35A	0	3	6	9	12	15	18
			F-16	32	5	5	5	5	5	5
			Total	**32**	**8**	**11**	**14**	**17**	**20**	**23**
VR-243	300 feet AGL to 9,500 feet MSL	5–8 NM right and 5–14 NM left of centerline	F-35A	0	3	6	9	12	15	18
			F-16	114	18	18	18	18	18	18
			Total	**114**	**21**	**24**	**27**	**30**	**33**	**36**
VR-244	300 feet AGL to 9,500 feet MSL	2–5 NM either side of centerline	F-35A	0	3	6	9	12	15	18
			F-16	301	47	47	47	47	47	47
			Total	**301**	**50**	**53**	**56**	**59**	**62**	**65**

[1] Aircraft types presented are representative of aircraft types operating in the airspace.
Note: F-35A training flights are limited to an altitude of 500 feet above ground level.
Key: AGL=above ground level; NM=nautical mile; VR=Visual Route.

The F-35A would operate at higher altitudes more often than legacy aircraft due to its advanced sensors and targeting capabilities. Approximately 85 percent of the training events in the F-35A training syllabus would be conducted at altitudes higher than 10,000 feet above ground level (AGL) (see Table LU 2.2–3).

Table LU 2.2–3. Representative A-10, F-16, and F-35A Altitude Use

Altitude (feet)	Percentage of Flight Hours		
	A-10	F-16	F-35A
> 30,000 MSL	0	1	6
18,000–30,000 MSL	0	3	34
10,000 AGL–18,000 MSL	4	40	45
5,000–10,000 AGL	33	26	8
2,000–5,000 AGL	26	13	4
500–2,000 AGL	30	14	3
100–500 AGL	7	3	0

Several training events in the F-35A syllabus could potentially use supersonic speeds. Supersonic operations would be conducted in authorized airspace and would be dictated by the altitudes authorized for each individual airspace unit.

Auxiliary Airfields

Aux-1 and Gila Bend AFAF are identified as the primary use auxiliary airfields for Luke AFB F-35A aircraft. Table LU 2.2–4 shows the number of airfield operations proposed at these two airfields under each aircraft scenario.

Table LU 2.2–4. Baseline and Projected Annual Auxiliary Airfield Operations at Aux-1 and Gila Bend AFAF

Aircraft Type	*Baseline Annual Airfield Operations*	*Projected Annual F-35A Airfield Operations*					
		Scenario L1 (24 Aircraft)	**Scenario L2 (48 Aircraft)**	**Scenario L3 (72 Aircraft)**	**Scenario L4 (96 Aircraft)**	**Scenario L5 (120 Aircraft)**	**Scenario L6 (144 Aircraft)**
Aux-1							
F-35A	0	4,474	8,948	13,422	17,897	22,371	26,845
F-16	18,954	508	508	508	508	508	508
Total	**18,954**	**4,982**	**9,456**	**13,930**	**18,405**	**22,879**	**27,353**
Gila Bend AFAF							
F-35A	0	5,776	11,553	17,331	23,108	28,884	34,661
F-16	5,596	2,278	2,278	2,278	2,278	2,278	2,278
Other Aircraft	4,045	4,045	4,045	4,045	4,045	4,045	4,045
Total	**9,641**	**12,099**	**17,876**	**23,654**	**29,431**	**35,207**	**40,984**

LU 2.2.2 Ranges, Ordnance, and Defensive Countermeasures

The F-35A is designed primarily as an air-to-ground weapons system. With the advances in technology, specifically targeting systems and guided munitions, the F-35A would only utilize guided ordnance, as listed in Chapter 2, Table 2–10. The guided munitions allow the F-35A to deploy munitions from a higher altitude and from longer distances than the unguided munitions often used by the A-10 or F-16. In addition to guided munitions, the F-35A is equipped with a 25-millimeter cannon. Chapter 2, Table 2–10, lists the type and number of munitions to be used by 24 F-35A while fulfilling the syllabus requirements for the training mission. Table LU 2.2–5 lists the same munitions prorated by the number of F-35A aircraft under each scenario at Luke AFB. As a training mission, live weapon drops would be infrequent, with only one training event per syllabus requiring live weapons.

The primary air-to-ground range available to Luke AFB is the Barry M. Goldwater Range (BMGR). BMGR is divided into BMGR West, which is under the jurisdiction of the Secretary of the Navy (MCAS Yuma), and BMGR East, which is under the jurisdiction of the Secretary of the Air Force (Luke AFB). These divisions reflect the typical pattern of military use, as most of the U.S. Marine Corps (USMC) and U.S. Navy range operations are conducted on BMGR West, and the Air Force range operations are typically conducted on BMGR East. However, with prior approval and coordination, all Services can utilize either area of the range.

Table LU 2.2–5. Projected F-35A Annual Munitions Use

Munitions Type	*Projected Annual F-35A Usage*						*Range Permitted*
	Scenario L1 (24 Aircraft)	**Scenario L2 (48 Aircraft)**	**Scenario L3 (72 Aircraft)**	**Scenario L4 (96 Aircraft)**	**Scenario L5 (120 Aircraft)**	**Scenario L6 (144 Aircraft)**	
GBU-12 (live)	36	72	108	144	180	216	BMGR
GBU-12 (inert)	78	156	234	312	390	468	BMGR
GBU-31 (inert)	20	40	60	80	100	120	BMGR
GBU-32 (inert)	26	52	78	104	130	156	BMGR
25-millimeter Target Practice (TP)	52,000	104,000	156,000	208,000	260,000	312,000	BMGR
MJU-61/B Training Flare	26,400	52,800	79,200	105,600	132,000	158,400	Authorized Airspace

Key: BMGR=Barry M. Goldwater Range; GBU=Guided Bomb Unit.

BMGR East is approximately 1.05 million acres of withdrawn public land and land owned by the U.S. Department of Defense (DoD). The primary mission of BMGR East is to support the training of Air Force, Air National Guard, AFRC, and Army Reserve National Guard units. Primary users of BMGR East include the F-16s from 56 FW and Tucson AGS, A-10s from Davis-Monthan AFB, and various users participating in Operation Snowbird out of Davis-Monthan AFB. There are eight aircraft weapons ranges in BMGR East. The eight aircraft weapons ranges allow a variety of munitions to be used, such as air-to-air gunnery, rockets, missiles, and lasers and a range of air-to-ground weapons, including live weapons up to 2,000 pounds. There are four manned ranges that permit only inert weapons. The remaining ranges permit both inert and live munitions. Each range is governed by individual restrictions and procedures dictating weapons types, aircraft headings, and times of use. BMGR East also utilizes electronic instrument sites to track and score military aircraft and range operations as well as simulate ground-to-air threats for training aircraft. There are 10 electronic transmitters stationed in the area below the restricted airspace, including sites within the BMGR East boundaries and Cabeza Prieta National Wildlife Refuge (NWR), and on U.S. Bureau of Land Management (BLM) and private land east of the Tohono O'odham Nation. Since BMGR East is proposed as the primary range complex for the F-35A mission at Luke AFB, operations in BMGR West would be infrequent. Therefore, any reference to BMGR in this EIS is referring to BMGR East only, unless otherwise specified.

The F-35A would also train with Mobile Jettison Unit (MJU)-61/B training flares, which are described in detail in Chapter 2, Section 2.4.5. The MJU-61/B training flare is similar to the M-206 and MJU-7/B flares currently used by F-16 aircraft. The F-35A flares would be released in the same airspace authorized for flare use by the F-16. These airspace units include R-2301E and R-2304/R-2305, which overlie BMGR. The minimum release altitudes for flares in R-2304/R-2305 and R-2301E for the portion of the airspace over government-owned or government-controlled land is determined by the fire danger and the type of flare and ranges between 300 feet AGL and 1,000 feet AGL. For the portion of R-2301E over Cabeza Prieta NWR, the minimum release altitude for flares is 1,500 feet AGL. Flares are also authorized for use in the Sells MOA/ATCAA, Gladden MOA/ATCAA, and Bagdad MOA/ATCAA. The minimum release altitude for flares in the Sells MOA/ATCAA is 3,000 feet AGL, depending on fire conditions. For Gladden and Bagdad MOAs/ATCAAs, the minimum release altitude is 5,000 feet AGL or 7,000 feet mean sea level (MSL), whichever is higher.

LU 2.2.3 Public Hearings and Agency Concerns

The Air Force conducted public hearings on the Draft EIS in communities in the immediate vicinity of Luke AFB, as well as in the vicinity of potential airspace and auxiliary airfields. Hearings were held during the week of February 14, 2012, and the public comment period extended through March 14, 2012. There were a total of 1,315 attendees who signed in at the public hearings. During the public hearings, people were given the opportunity to provide oral and/or written comments on the F-35A Training Basing Draft EIS. Some of the comments and questions are summarized below in Table LU 2.2–6, along with the location in the EIS where the comment is addressed.

Table LU 2.2–6. Issues and Questions Identified During Draft EIS Public Review

Issues and Questions	*Section in EIS or Comment Response Where Issue Is Addressed*			
	Boise AGS	*Holloman AFB*	*Luke AFB*	*Tucson AGS*
Do we need the F-35A?	1.1; 1.3	1.1; 1.3	1.1; 1.3	1.1; 1.3
How does the F-35A noise compare with that of other military aircraft?	3.2; BO 3.2.1	3.2; HO 3.2.1	3.2; LU 3.2.1	3.2; TU 3.2.1
How do the different F-35A alternatives and scenario impacts compare?	BO 3.1.2 through BO 3.15.2; Response NP-13	HO 3.1.2 through HO 3.15.2; Response NP-13	LU 3.1.2 through LU 3.15.2; Response NP-13	TU 3.1.2 through TU 3.15.2; Response NP-13
What is No Action?	2.5	2.5	2.5	2.5
Explain noise measures in the EIS.	3.2; Appendix B	3.2; Appendix B	3.2; Appendix B	3.2; Appendix B
What are the F-35A impacts on property values or property tax revenues?	3.9.2; BO 3.11.1.2; Appendix B.2.7; Response SO-13	3.9.2; HO 3.11.1.2; Appendix B.2.7; Response SO-13	3.9.2; LU 3.11.1.2; Appendix B.2.7; Response SO-13, SO-31	3.9.2; TU 3.11.1.2; Appendix B.2.7; Response SO-13
Could residents lose their homes or businesses as a result of F-35A noise?	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26
Test flyovers of communities are needed for a community survey before an EIS can be prepared.	Response SO-7, NP-13	Response SO-7, NP-13	Response SO-7, NP-13	Response SO-7, NP-13
Would the Air Force regulate flight altitudes, training times, takeoffs and landings, or institute other mitigations to reduce noise impacts?	Response NP-33	Response NP-33	Response NP-33	Response NP-33
Will schools be retrofitted or closed due to noise impacts?	2.8.3; Response SO-32, SO-37		2.8.3; Response SO-32, SO-37	2.8.3; Response SO-32, SO-37
How would the basing of the F-35A mission affect Arizona State land use laws regarding property near a military airport?			LU 3.2.1; LU 3.2.2; LU 3.10.1; LU 3.10.2	TU 3.10.3.1
Can the F-35A train in local airspace?	2.2.1; BO 2.2	2.2.1; HO 2.2	2.2.1; LU 2.2	2.2.1; TU 2.2
What sonic booms are associated with the F-35A?	BO 3.2.2	HO 3.2.2	LU 3.2.2	TU 3.2.2
What would the impact on recreational areas under the airspace be?	BO 3.10.2.1; BO 3.10.2.2	HO 3.10.2.1; HO 3.10.2.2	LU 3.10.2.1; LU 3.10.2.2	TU 3.10.2.1; TU 3.10.2.2
What low-level overflights would occur?	BO 2.2.1; BO 3.1.2	HO 2.2.1; HO 3.1.2	LU 2.2.1; LU 3.1.2	TU 2.2.1; TU 3.1.2
What would be the impact on communities under the airspace?	BO 3.10.1; BO 3.10.2; BO 3.11.1; BO 3.11.2; Response SO-6, SO-45	HO 3.2.2; HO 3.10.1; HO 3.10.2; HO 3.11.1; HO 3.11.2; Response SO-6, SO-20, SO-45	LU 3.10.1; LU 3.10.2; LU 3.11.1; LU 3.11.2; Response SO-6, SO-45	TU 3.10.1; TU 3.10.2; TU 3.11.1; TU 3.11.2; Response SO-6, SO-45

Issues and Questions	*Section in EIS or Comment Response Where Issue Is Addressed*			
	Boise AGS	*Holloman AFB*	*Luke AFB*	*Tucson AGS*
How do we make damage claims for noise impacts?	BO 2.8.4	HO 2.8.4	LU 2.8.4	TU 2.8.4
What would the air quality emissions and air pollution effects be?	BO 3.3	HO 3.3	LU 3.3	TU 3.3
How will F-35As use Davis-Monthan AFB?				2.3.4; TU 3.1.1.1; TU 3.4.1.2
What are the safety risks from pilot error or mechanical malfunction?	BO 3.4.1; BO 3.4.2	HO 3.4.1; HO 3.4.2	LU 3.4.1; LU 3.4.2	TU 3.4.1; TU 3.4.2
How are pilots trained for such a sophisticated aircraft?	2.4.3	2.4.3	2.4.3	2.4.3
Are there special safety issues associated with a single-seat, single-engine aircraft?	BO 3.4.2.2	HO 3.4.2.2	LU 3.4.2.2	TU 3.4.2.2
What testing would occur before training aircraft beddown and flight over cities?	2.4.3.2	2.4.3.2	2.4.3.2	2.4.3.2
What chaff and flare use would occur with the F-35A?	2.4.5; BO 3.4.2.2	2.4.5; HO 3.4.2.2	2.4.5; LU 3.4.2.2	2.4.5; TU 3.4.2.2
Would the potential for fire increase with the F-35A?	2.4.5; BO 3.4.2.2; Response SO-8	2.4.5; HO 3.4.2.2; Response SO-8	2.4.5; LU 3.4.2.2; Response SO-8	2.4.5; TU 3.4.2.2; Response SO-8
Would jet fuel be dumped?	BO 3.4.2.2	HO 3.4.2.2	LU 3.4.2.2	TU 3.4.2.2
Would soils or water be impacted?	BO 3.5; BO 3.7	HO 3.5; HO 3.7	LU 3.5; LU 3.7	TU 3.5; TU 3.7
What would the impacts on wildlife and sensitive species be?	BO 3.6; BO 3.8; Appendix B.2.6	HO 3.6; HO 3.8; Appendix B.2.6	LU 3.6; LU 3.8; Appendix B.2.6	TU 3.6; TU 3.8; Appendix B.2.6
How would domestic and ranch animals be impacted?	2.8; Appendix B.2.6	2.8; Appendix B.2.6	2.8; Appendix B.2.6	2.8; Appendix B.2.6
What traditional or historic impacts would occur?	BO 3.9.1; BO 3.9.2	HO 3.9.1; HO 3.9.2	LU 3.9.1; LU 3.9.2	TU 3.9.1; TU 3.9.2
Would land use under the airspace be impacted?	BO 3.10.1; BO 3.10.2; BO 3.11.2	HO 3.10.1; HO 3.10.2; HO 3.11.2	LU 3.10.1; LU 3.10.2; LU 3.11.2	TU 3.10.1; TU 3.10.2; TU 3.11.2
How would existing land use statutes be affected?	3.2.2; BO 3.11.2.2	3.2.2	3.2.2; LU 3.2; LU 3.10	3.2.2; TU 3.10.3.1
What would the impacts on the local economy be?	BO 3.10.1.2; BO 3.10.2; BO 3.11.1.2	HO 3.10.1.2; HO 3.10.2; HO 3.11.1.2	LU 3.10.1.2; LU 3.10.2; LU 3.11.1.2	TU 3.10.1.2; TU 3.10.2; TU 3.11.1.2
How many jobs would be associated with the F-35A basing?	BO 3.11.1.2; Response SO-21, SO-25	HO 3.11.1.2; Response SO-21, SO-25	LU 3.11.1.2; Response SO-21, SO-25	TU 3.11.1.2; Response SO-21, SO-25
Would noise impact tourism or the ability to enjoy the natural environment?	BO 3.10.2	HO 3.10.2	LU 3.10.2	TU 3.10.2
Who will pay for the impact on school funding and neighborhoods?	2.8.2	2.8.2	2.8.2	2.8.2
A comprehensive community cost-benefit study is needed.	Response DO-10, SO-13	Response DO-10, SO-13	Response DO-10, SO-13	Response DO-10, SO-13
How would minorities and low-income populations be impacted?	BO 3.12.1; BO 3.12.2	HO 3.12.1; HO 3.12.2	LU 3.12.1; LU 3.12.2	TU 3.12.1; TU 3.12.2
What would the health impacts on children and young adults be?	BO 3.12.2.2; Appendix B.2.5	HO 3.12.2.2; Appendix B.2.5	LU 3.12.2.2; Appendix B.2.5	TU 3.12.2.2; Appendix B.2.5
What would the noise effects on schools or children be?	BO 3.2.1.2; BO 3.12.2.2; Appendix B.2.5	HO 3.2.1.2; HO 3.12.2.2; Appendix B.2.5	LU 3.2.1.2; LU 3.12.2.2; Appendix B.2.5	TU 3.2.1.2; TU 3.12.2.2; Appendix B.2.5

LU 3.0 Luke AFB Affected Environment/Environmental Consequences

LU 3.1 Airspace Management and Use

LU 3.1.1 Base

LU 3.1.1.1 Base Affected Environment

The airspace resource area and analysis methodology, as well as key terms and definitions, are discussed in detail in Chapter 3, Section 3.1. Luke AFB, a military facility, is the home of the 56 FW and is located near the western boundary of Glendale, Arizona. Air traffic control (ATC) services are provided by the Air Force–operated Luke Terminal Radar Approach Control Facility (RAPCON), which controls the airspace surrounding the airport, and the Air Force–operated Luke AFB control tower, which is responsible for runway operations and air traffic within the Class D airspace. ATC services are provided to both military and civil aircraft within these areas.

Luke AFB is located adjacent to the Phoenix Class B airspace with a Mode C transponder requirement. A Special Air Traffic Rule (SATR) requirement also exists for Visual Flight Rule (VFR) aircraft to establish two-way radio communications in the vicinity of Luke AFB. All aircraft, civil or military, that desire to operate within 30 nautical miles (NM) of the Phoenix VHF Omni-Directional Radio Range Tactical Air Navigation Aid (VORTAC) are required to be equipped with an operable Mode C transponder. The Luke AFB SATR airspace and the Phoenix Class B airspace are depicted on the Phoenix sectional aeronautical chart published by the U.S. Department of Transportation, Federal Aviation Administration (FAA).

Luke AFB's elevation is 1,085 feet MSL; it covers an area of approximately 4,200 acres and has two runways: Runway 03L/21R is 10,012 feet long by 150 feet wide and of asphalt construction in the middle 5,400 feet and concrete at the approach ends, and Runway 03R/21L is 9,904 feet long by 150 feet wide.

Sufficient navigational aids and the imbedded RAPCON provide Luke AFB with full runway and instrument approach/departure capabilities. Runway 03R/21L accounts for almost 100 percent of all departures. Approximately 56 percent of all arrivals are overhead patterns, predominantly to Runway 21R, and approximately 36 percent of all arrivals are straight-ins, predominantly to Runway 21L. Simulated flameout approaches account for most of the other 8 percent of arrivals. Visual closed patterns are included in the overhead patterns, and radar patterns are included in the straight-in estimates. Baseline and projected annual sortie-operations at Luke AFB are shown in Table LU 2.1–1.

LU 3.1.1.2 Base Environmental Consequences

As shown in Table LU 2.1–1, under baseline conditions, 85,213 runway operations were conducted at Luke AFB. Under the beddown scenarios, each increment of 24 PAA F-35A aircraft would conduct approximately 12,662 aircraft operations annually, including practice approaches and takeoffs/landings at Luke AFB. However, under Scenarios L1 through L5, the

addition of F-35A aircraft operations would be more than offset by reductions in F-16 operations resulting from the relocation/retirement of F-16 aircraft currently based at Luke AFB. Operational increases under Scenario L6 resulting from this proposal could be accommodated by Luke Tower and RAPCON, and no modifications to existing Luke AFB airport airspace and airfield environments would be necessary. Similarly, no modifications to any SUA or ASU are necessary or planned.

LU 3.1.2 Airspace

LU 3.1.2.1 Airspace Affected Environment

Special Use Airspace and Military Training Routes

Numerous blocks of SUA and ASU currently support flight training activities of the 56 FW and are necessary to support an F-35A training mission. The SUA and ASU consist of numerous MOAs, ATCAAs, MTRs, restricted airspace, and air-to-ground ranges. Figure LU 2.2–1 depicts the location of this airspace in relation to Luke AFB.

Table LU 3.1–1 shows the primary use airspace projected to be used by the F-35As and describes the applicable altitudes and published use times of each area. Baseline annual sortie-operations in the primary use MOA/ATCAAs and Restricted Area airspace units are shown in Table LU 2.2–1, and baseline and projected operations on the MTRs are shown in Table LU 2.2–2. The Sells MOA/ATCAA; Gladden/Bagdad MOA/ATCAA; R-2301E, which includes the BMGR Tactical (TAC) ranges; R-2304; and R-2305 are scheduled and managed by the 56 Range Management Office. Other regular users of Sells MOA/ATCAA, R-2301E Air-to-Air Area, and BMGR TAC ranges include F-16s from the 162 FW at Tucson AGS and A-10s from the 355 FW at Davis-Monthan AFB. A scheduling agreement between the three units precludes undue conflicts and allows all three units ample access to accomplish training goals. No changes to the existing airspace are currently under way or are planned, and projected use of SUA/ASU by aircraft not based at Luke AFB is expected to be unchanged.

Eight MTRs are currently used by the 56 FW for low-level training and all are included in the primary training airspace for the F-35A. Pertinent route information is shown in Table LU 3.1–1. Baseline and projected usage are shown in Table LU 2.2–2.

Auxiliary Airfields

Aux-1 and Gila Bend AFAF have been identified as auxiliary airfields for the F-35A. Although not suitable for touch-and-go landings due to runway deterioration, additional instrument training by the current F-16 mission is conducted at Aux-1, approximately 15 miles northwest of the main base. Baseline and projected sortie-operations for Aux-1 are shown in Table LU 2.2–4. ATC services at Aux-1 are provided by Luke RAPCON.

Table LU 3.1–1. Description of Primary Use Airspace for Projected F-35A Use

Airspace	Airspace Type	Airspace Floor	Airspace Ceiling	Airspace Published Use Time (local)	Managed By
Sells	MOA and overlying ATCAA	3,000 feet AGL	FL510	0600–1900[1]	56 FW
Gladden/Bagdad	MOA and overlying ATCAA	7,000 feet MSL or 5,000 feet AGL, whichever is higher	FL510	0600–1900[1]	56 FW
R-2301E Air-to-Air Area	R-2301E restricted airspace	Surface	FL800	0630–2400[2]	56 FW
BMGR North TAC/ South TAC Ranges	R-2301E restricted airspace	Surface	FL800	0630–2400[2]	56 FW
BMGR East TAC Range	R-2304/R-2305 restricted airspace	Surface	FL240	0630–2400[1]	56 FW
VR-239	MTR	300 feet AGL	9,500 feet MSL	0600–2400[3]	56 FW
VR-245	MTR	300 feet AGL	9,000 feet MSL	0600–2400[3]	56 FW
VR-223	MTR	500 feel AGL	9,000 feet MSL	0600–2400[3]	56 FW
VR-231	MTR	100 feet AGL	7,000 feet MSL	0600–2400[3]	56 FW
VR-241	MTR	300 feet AGL	9,500 feet MSL	0600–2400[3]	56 FW
VR-242	MTR	300 feet AGL	9,000 feet MSL	0600–2400[3]	56 FW
VR-243	MTR	300 feet AGL	9,500 feet MSL	0600–2400[3]	56 FW
VR-244	MTR	300 feet AGL	9,500 feet MSL	0600–2400[3]	56 FW

[1] Monday through Friday; other times by NOTAM [Notice to Airmen].
[2] Daily; other times by NOTAM.
[3] Also occasional weekends/holidays in conjunction with BMGR or Sells MOA.
Key: FL=flight level.
Source: FAA 2010a.

Gila Bend AFAF, approximately 50 miles to the southwest, is also available, has an Air Force contract control tower, and is used for touch-and-go landings and simulated flameout approaches. The airfield has one 8,500-foot-long asphalt runway (17/35) that is available for aircraft operating under VFR conditions only. Gila Bend AFAF is closer to BMGR air-to-ground ranges than Luke AFB, which enhances its value as an emergency recovery airfield for those aircraft using BMGR. Baseline and projected sortie-operations for Gila Bend AFAF are also shown in Table LU 2.2–4.

LU 3.1.2.2 Airspace Environmental Consequences

Special Use Airspace and Military Training Routes

Table LU 2.2–1 shows the projected number of sortie-operations that would be conducted cumulatively under Scenarios L1 through L6, with the addition of sorties flown by all other aircraft that are expected to continue using these same MOAs, ATCAAs, and restricted airspace.

Annual sortie-operations in Gladden and Bagdad MOAs/ATCAAs would not exceed baseline totals under Scenarios L1 or L2. Under Scenarios L3, L4, L5, and L6, total annual sortie-operations in this airspace would increases by 6 percent, 36 percent, 66 percent, and 96 percent, respectively. Annual sortie-operations in Sells MOA/ATCAA would not exceed baseline totals under Scenario L1, L2, L3, or L4. Under Scenarios L5 and L6, projected total annual operations would increase by 11 percent and 22 percent, respectively. Total annual sortie-operations in the R-2301E Air-to-Air Area would not exceed baseline totals under Scenario L1, L2, L3, L4, or L5, but would increase by 5 percent under Scenario L6. Total annual sortie-operations in the BMGR TAC ranges would not exceed baseline totals under any of the beddown scenarios.

A current waiver exists, allowing supersonic operations in Sells MOA/ATCAA and Gladden and Bagdad MOAs/ATCAAs down to 10,000 feet MSL, and in R-2301E and BMGR North and South TAC Ranges down to 5,000 feet AGL, except over manned ranges, where the minimum altitude for supersonic operations is 10,000 feet MSL. Supersonic operations are not permitted in the East TAC Range. Sufficient time is available in those areas to support the training sorties during which supersonic operations of the 26 FMS F-16s and up to 144 F-35A aircraft would occur. The 56 FW and 162 FW would need to ensure that projected supersonic operations are within limitations specified in that waiver or obtain a new waiver that covers the projected operations.

Increases in total sortie-operations conducted annually in primary use airspace under the beddown scenarios would exceed 20 percent only in Gladden and Bagdad MOAs/ATCAAs and only under Scenarios L4, L5, and L6. Even under Scenarios L4, L5, and L6, sufficient time is available in the primary use airspace units to accomplish required training, and the F-35A training would not have adverse effects on airspace management throughout this region. The operational requirements associated with the F-35A training activities would not require changes to the current lateral or vertical configuration of the MOAs, ATCAAs or restricted airspace. The continued sharing of some airspace with flying units based at Tucson AGS and Davis-Monthan AFB would require close attention to scheduling and some prioritization to ensure that each unit's training needs are met and student graduations occur on time.

Adequate visual routes exist and are available to aircraft based at Luke AFB to meet the training needs of up to 144 F-35A aircraft, the two F-16 FMS squadrons that are expected to remain at Luke AFB for the foreseeable future, and other current users of the MTRs. Projected F-35A use of the MTRs would be slightly more than two sortie-operations per average operational day. The total amount of scheduled time on the routes is well within the time available for use of those routes.

Auxiliary Airfields

The F-35A beddown would also change airfield traffic at Aux-1 and Gila Bend AFAF, as shown in Table LU 2.2–4. Under the F-35A aircraft scenarios, F-16 traffic at Gila Bend AFAF would decrease by 3,318 aircraft operations annually, and at Aux-1, by 18,446 aircraft operations. Each 24 PAA increment of F-35A aircraft would conduct 5,776 annual aircraft operations at Gila Bend AFAF and 4,474 aircraft operations at Aux-1. ATC capability is sufficient to handle the projected increases, and existing airport airspace and airfield environments are adequate with no planned changes. Under Scenarios L1 through L6, total Gila Bend AFAF annual airfield operations would increase by approximately 25 percent (under Scenario L1) up to 325 percent (under Scenario L6). Total operations at Aux-1 would decrease under Scenarios L1 through L4 by between 74 percent and 3 percent and would increase under Scenarios L5 and L6 by 21 and 44 percent, respectively.

LU 3.2 Noise

Noise, which is defined simply as unwanted sound, has the potential to affect several environmental resource areas. Comments received during scoping covered a broad range of issues and requested a comprehensive presentation of noise effects. This section will describe noise effects on human annoyance and health, as well as physical effects on structures in the Luke AFB region of influence (ROI). Noise impacts on biological, land use, socioeconomic, and cultural resources are described briefly in this section and are discussed in more detail in separate sections dealing with those environmental resources. A discussion of the methods used to assess noise impacts throughout this EIS can be found in Chapter 3, Section 3.2. A brief summary of the different measurements used to quantify noise is provided for convenience below.

Different noise measurements (or metrics) quantify noise. These noise metrics are as follows:

- DNL (Day–Night Average Sound Level) combines the levels and durations of noise events, the number of events over a 24-hour period, and more-intrusive nighttime noise to calculate an average noise exposure.
- DNL_{mr} (Onset Rate-Adjusted Day–Night Average Sound Level) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace units, DNL_{mr} is calculated based on the average number of operations per day in the busiest month of the year.
- CDNL (C-Weighted Day–Night Average Sound Level) is a day–night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of single impulsive noises, such as sonic booms.
- L_{max} (Maximum Noise Level) is the highest noise level reached during an event, such as an aircraft overflight.
- SEL (Sound Exposure Level) accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.
- SEL_r (Onset Rate-Adjusted Sound Exposure Level) is the same as SEL but accounts for the onset-rate of a sound, which can make a noise seem louder.
- L_{eq} (Equivalent Sound Level) represents aircraft noise levels averaged over a specified time period. The L_{eq} is useful for considering noise effects such as during a school day ($L_{eq(SD)}$; 7:00 a.m. to 4:00 p.m.).

Different metrics measure different impacts. Annoyance represents the most common noise impact. There is a correlation between the percentages of people in a community highly annoyed and the average noise level measured using the DNL metric. Impulsive noise, as measured in CDNL, is annoying to more people than DNL.

LU 3.2.1 Base

LU 3.2.1.1 Base Affected Environment

Luke AFB is the largest F-16 training base in the world and, in addition to supporting F-16 operations, it accommodates a wide variety of transient aircraft types.

Luke AFB retired 36 F-16 aircraft in accordance with recommendations of the 2005 BRAC commission, and an Environmental Assessment (EA) analyzing the impacts of this action was completed in 2007 (Luke AFB 2007a). The baseline DNL contours shown in Figure LU 3.2–1 are identical to the noise contours published in the 2007 BRAC EA, reflecting noise levels once the drawdown action is completed.

Under baseline conditions, approximately 7,042 off-installation acres and 1,601 off-installation residents are affected by noise levels in excess of 65 dB DNL. Approximately 2,302 on-installation acres and an estimated 919 on-installation residents are affected by noise levels exceeding 65 dB DNL.

The implementation of regulatory requirements to reduce noise impacts in areas adjacent to Luke AFB was addressed in state statutes (*Arizona Revised Statutes* [ARS] 28-8481, -8482) adopted by the State of Arizona, which utilized noise contours from a 1988 Joint Land Use Study (JLUS). The state has codified land use limitations and mandatory noise attenuation measures for land use categories near military airports, including within the 1988 JLUS 65 dB DNL contour. Figure LU 3.2–1 shows the 65 dB DNL noise contour from the 1988 Luke AFB JLUS overlaid on baseline noise contours.

Noise conditions at several representative noise-sensitive locations are presented in Section LU 3.2.1.2, Table LU 3.2–3. The locations of the representative noise-sensitive locations can be seen in Figure LU 3.2–2. The areas in the vicinity of the representative locations experience similar aircraft noise levels and noise impacts. With the exception of Residential Area No. 3 (Location No. 5), the Chapel Center on Luke AFB (Location No. 17), and the Base Chapel on Luke AFB (Location No. 18), all of the locations studied experience noise levels below 65 dB DNL. The average number of indoor noise events per daytime hour with some potential to interfere with speech (exceeding 50 dB L_{max}) among all locations studied is 9 with windows open. The average number of events among all locations exceeding 50 dB L_{max} if windows are closed is 6. None of the five schools studied experience an exterior 'school day' L_{eq} ($L_{eq(SD)}$) of greater than 65 dB. The average percent are of persons awakened at least once per night by aircraft noise among all locations studied is 10 with windows open and 5 with windows closed. No on- or off-installation residences are affected by noise levels greater than 80 dB DNL, the noise level at which long-term potential hearing loss (PHL) risk is considered to be substantial. Forty-three structures on Luke AFB are affected by noise levels greater than 80 dB DNL under baseline conditions. Employees working on the installation are protected by DoD occupational hearing loss regulations.

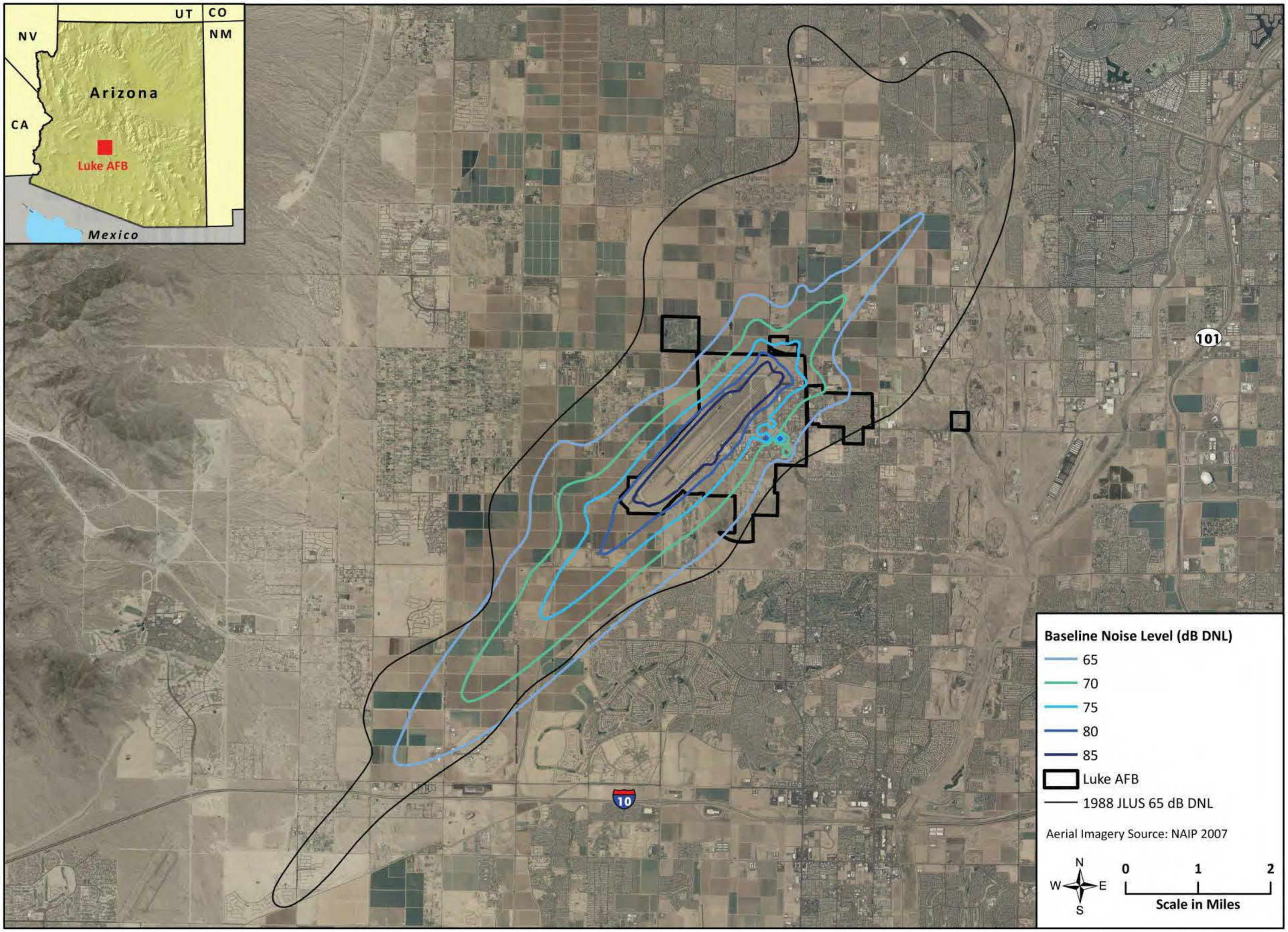


Figure LU 3.2–1. Luke AFB Joint Land Use Study (JLUS) and Baseline Noise Contours

LU 3.2.1.2 Base Environmental Consequences

Noise impacts under each of the beddown scenarios were modeled using NOISEMAP Version 7.3. Figures LU 3.2–2, LU 3.2–3, LU 3.2–4, LU 3.2–5, LU 3.2–6, and LU 3.2–7 show DNL contours under Scenarios L1, L2, L3, L4, L5, and L6, respectively, overlaid on baseline noise contours. The off-installation area affected by noise levels greater than 65 dB DNL would decrease by approximately 2,279 acres and 635 acres, respectively, under Scenarios L1 and L2 (see Table LU 3.2–1). Reductions in noise levels would occur as a result of scheduled drawdown of additional F-16 aircraft from Luke AFB, as described in Table LU 2.0–1. Under Scenarios L3, L4, L5, and L6, the number of off-installation acres exposed to noise levels greater than 65 dB DNL would increase by 874, 2,356, 3,637, and 4,609, respectively. The number of on-installation acres affected by noise levels greater than 65 dB would decrease by 55 under Scenario L1, but would increase by 148, 326, 403, 467, and 525 under Scenarios L2, L3, L4, L5, and L6, respectively. The estimated total number of off-installation residents affected under Scenarios L1, L2, and L3 would decrease by approximately 1,401, 1,113, and 420, respectively. Under Scenarios L4, L5, and L6, the number of off-installation residents affected by noise levels greater than 65 dB DNL would increase by 622, 1,615, and 3,739, respectively. The number of on-installation residents affected by noise levels greater than 65 dB DNL would decrease by 153 under Scenario L1 and remain the same under Scenario L2. Under Scenarios L3, L4, L5, and L6, the number would increase by 102, 255, 459, and 663, respectively. Persons experiencing an increase in noise level would be more likely to become annoyed by the noise, as described in Chapter 3, Table 3–3. Persons not within the 65 dB DNL noise contour would experience aircraft noise, although with less frequency and/or intensity, and could become highly annoyed as a result of the noise. As noted in Section 3.2, certain persons, such as persons with autism, are more strongly affected by noise. The relationship between noise level and annoyance can be accurately predicted only for the community as a whole, as individuals' responses to noise are dependent on several physical, psychological, and emotional factors. The estimates of off-installation residents impacted by elevated noise levels presented in Table LU 3.2–1 represent the best available data from the 2010 census.

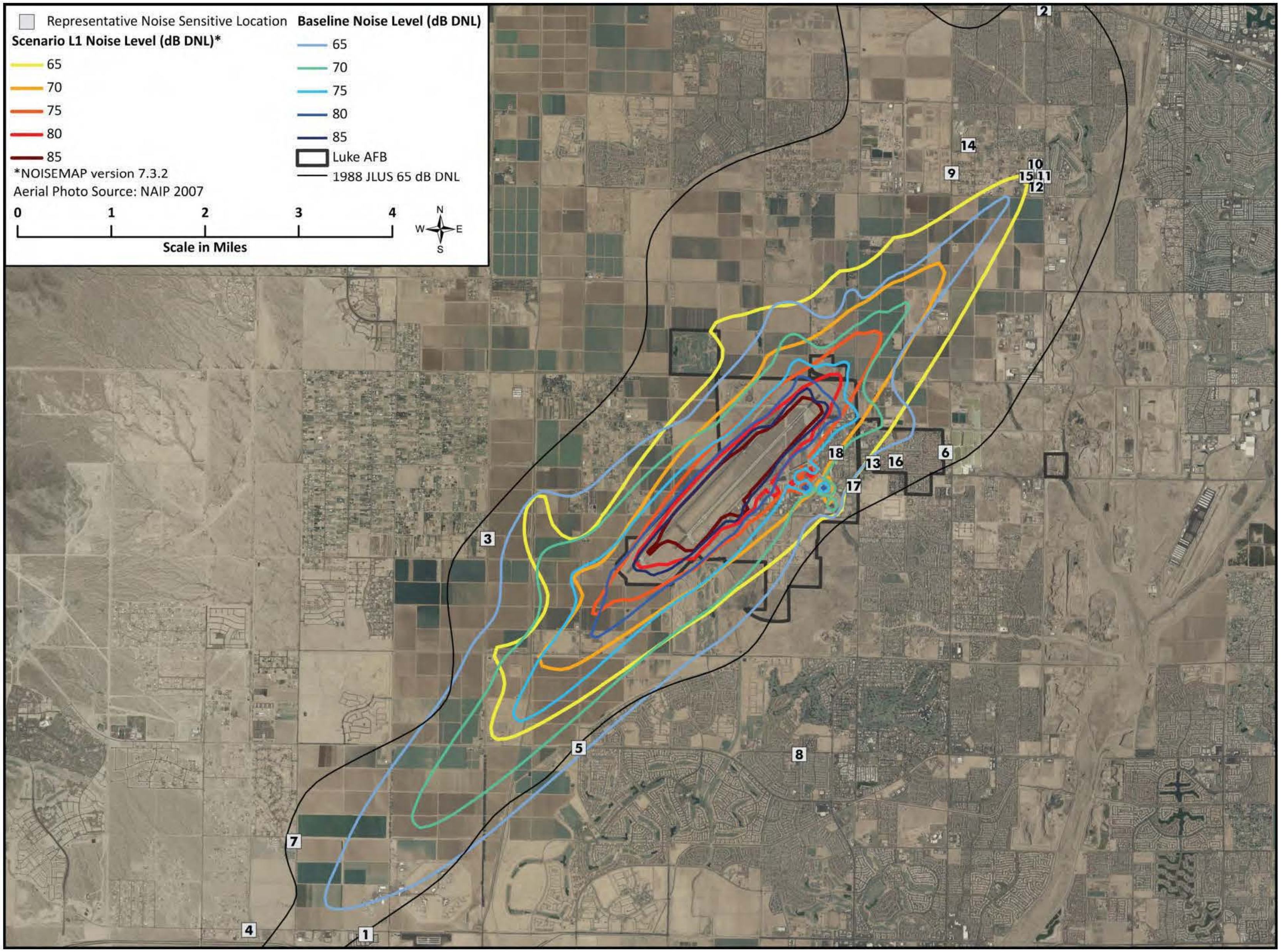


Figure LU 3.2–2. Scenario L1 and Baseline Noise Contours

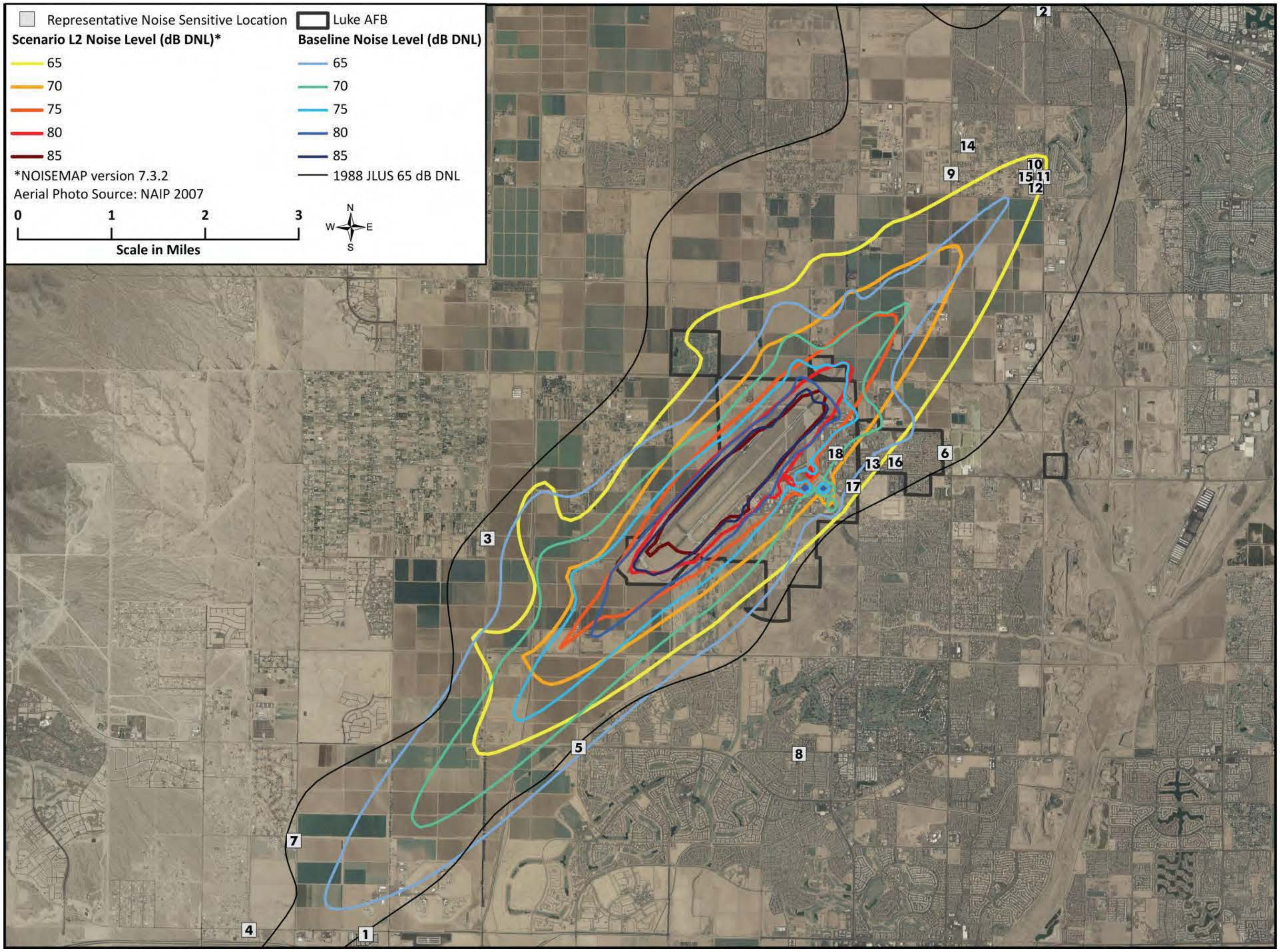


Figure LU 3.2–3. Scenario L2 and Baseline Noise Contours

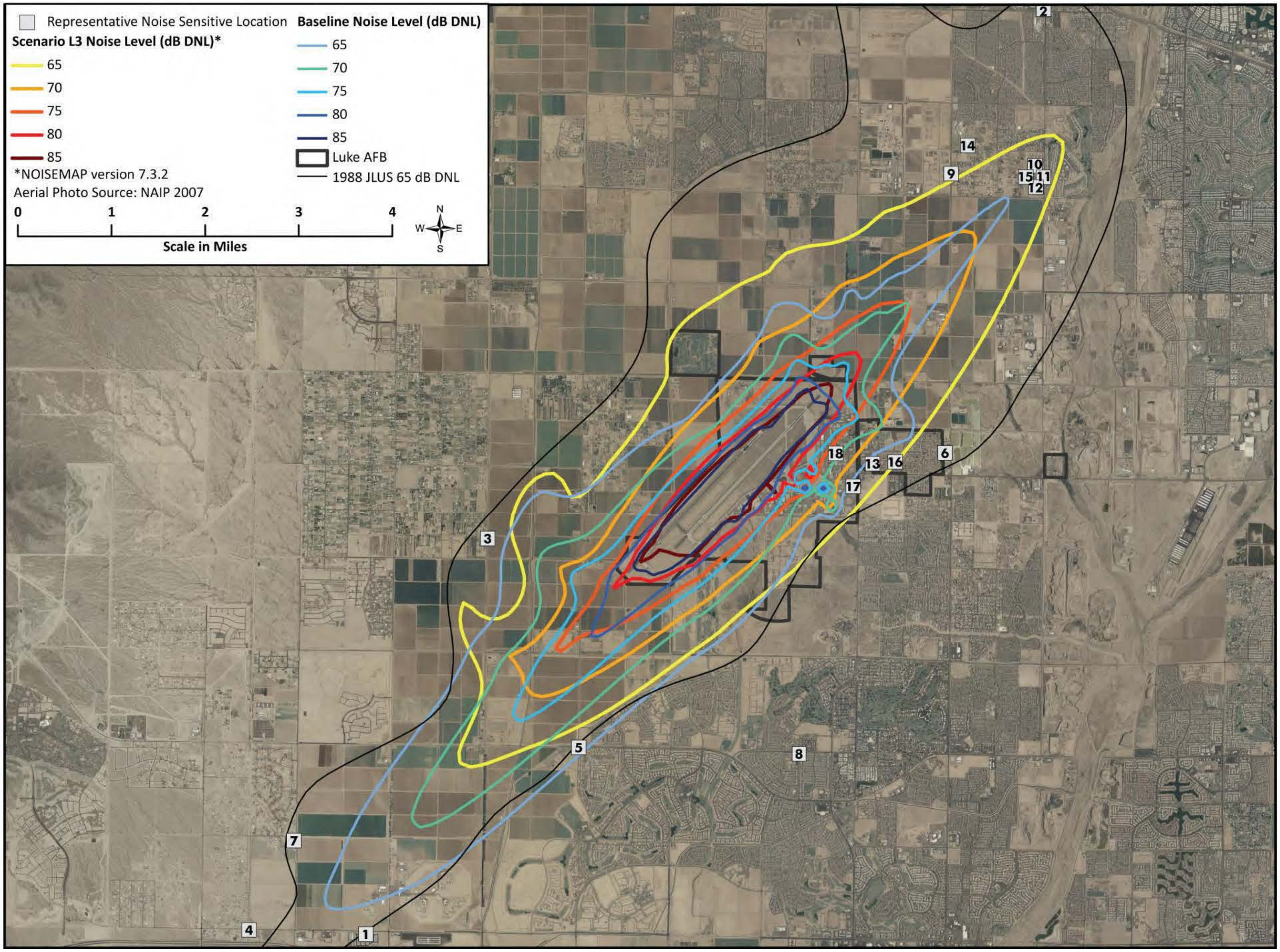


Figure LU 3.2–4. Scenario L3 and Baseline Noise Contours

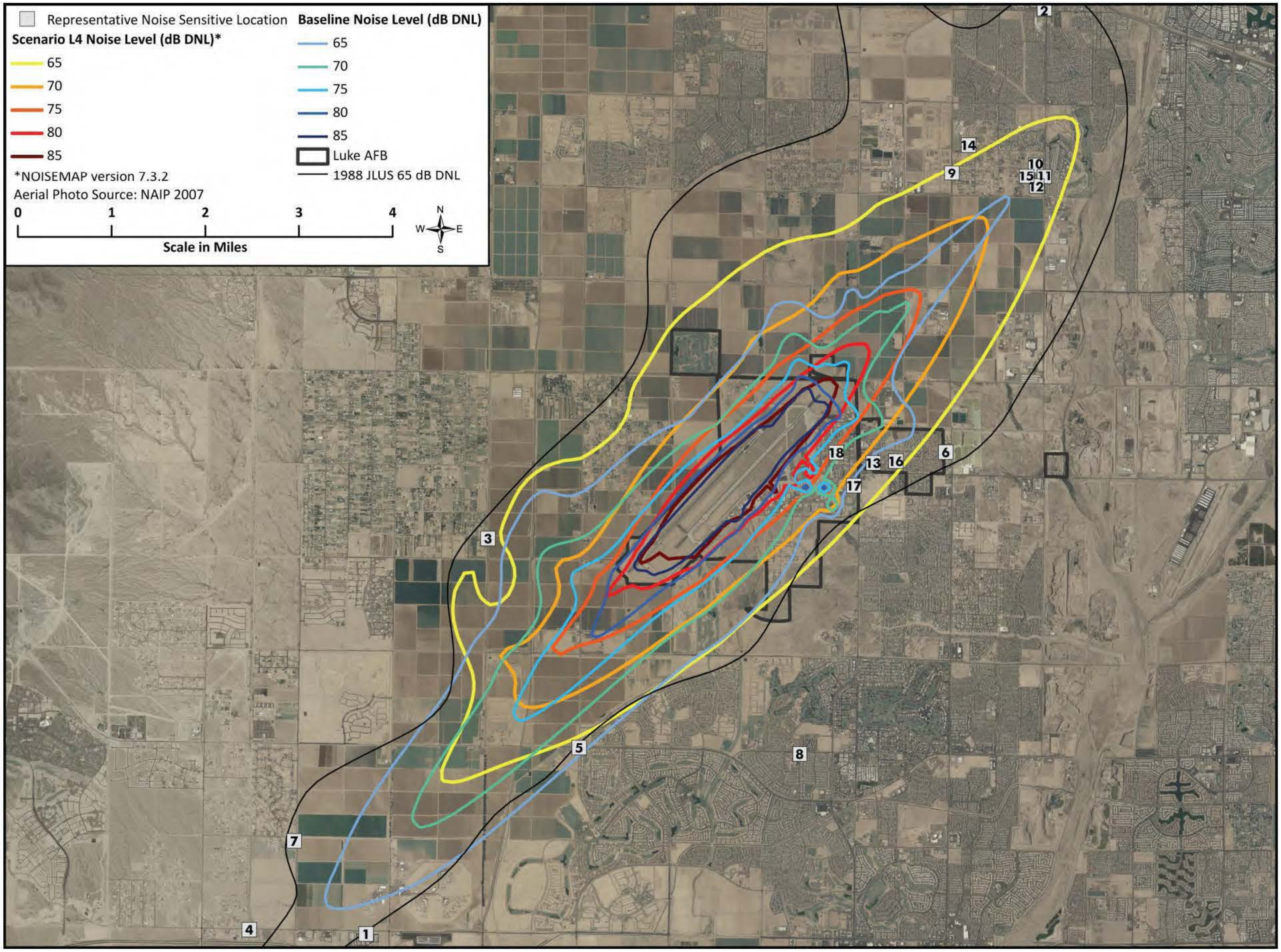


Figure LU 3.2–5. Scenario L4 and Baseline Noise Contours

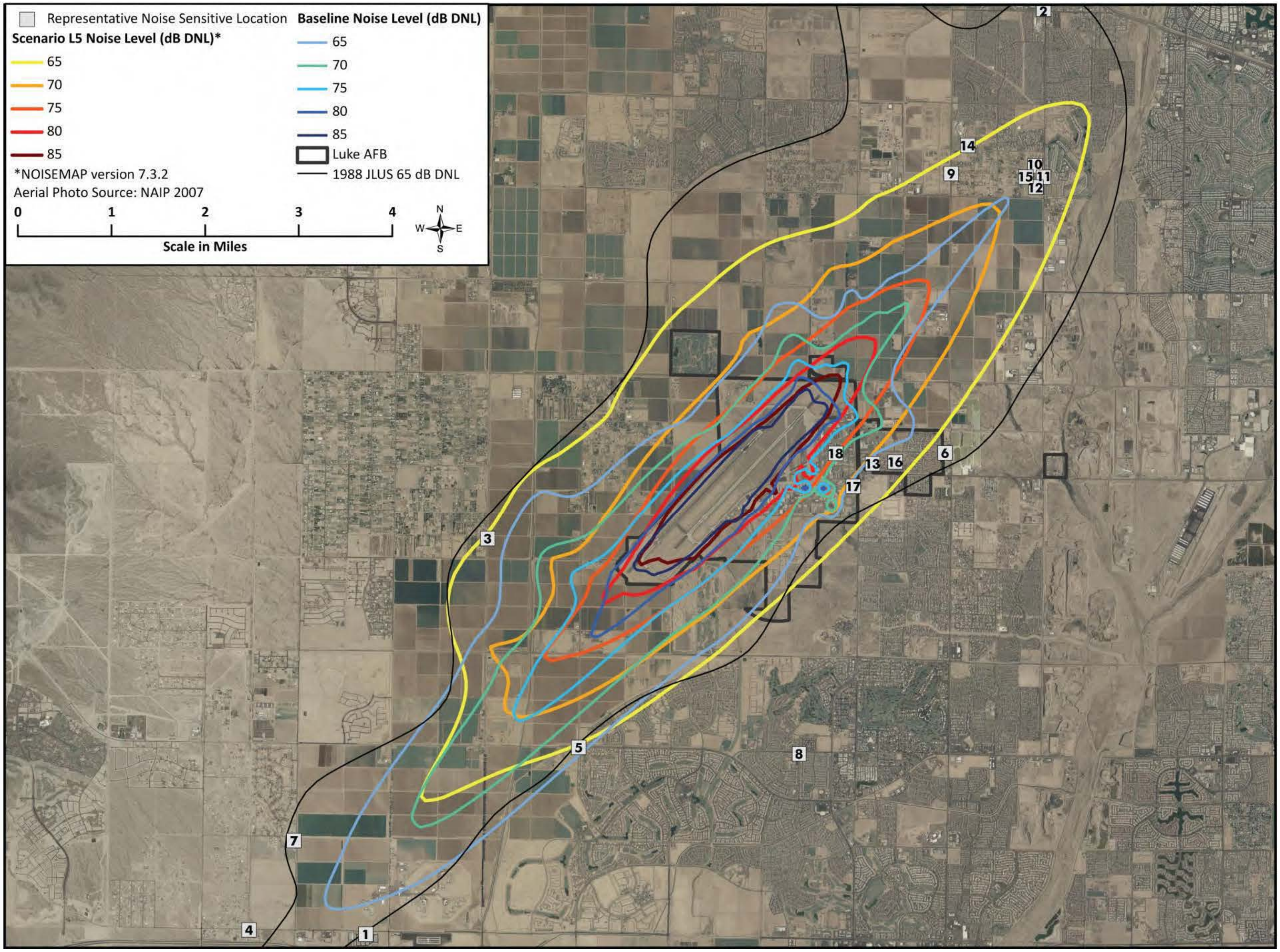


Figure LU 3.2–6. Scenario L5 and Baseline Noise Contours

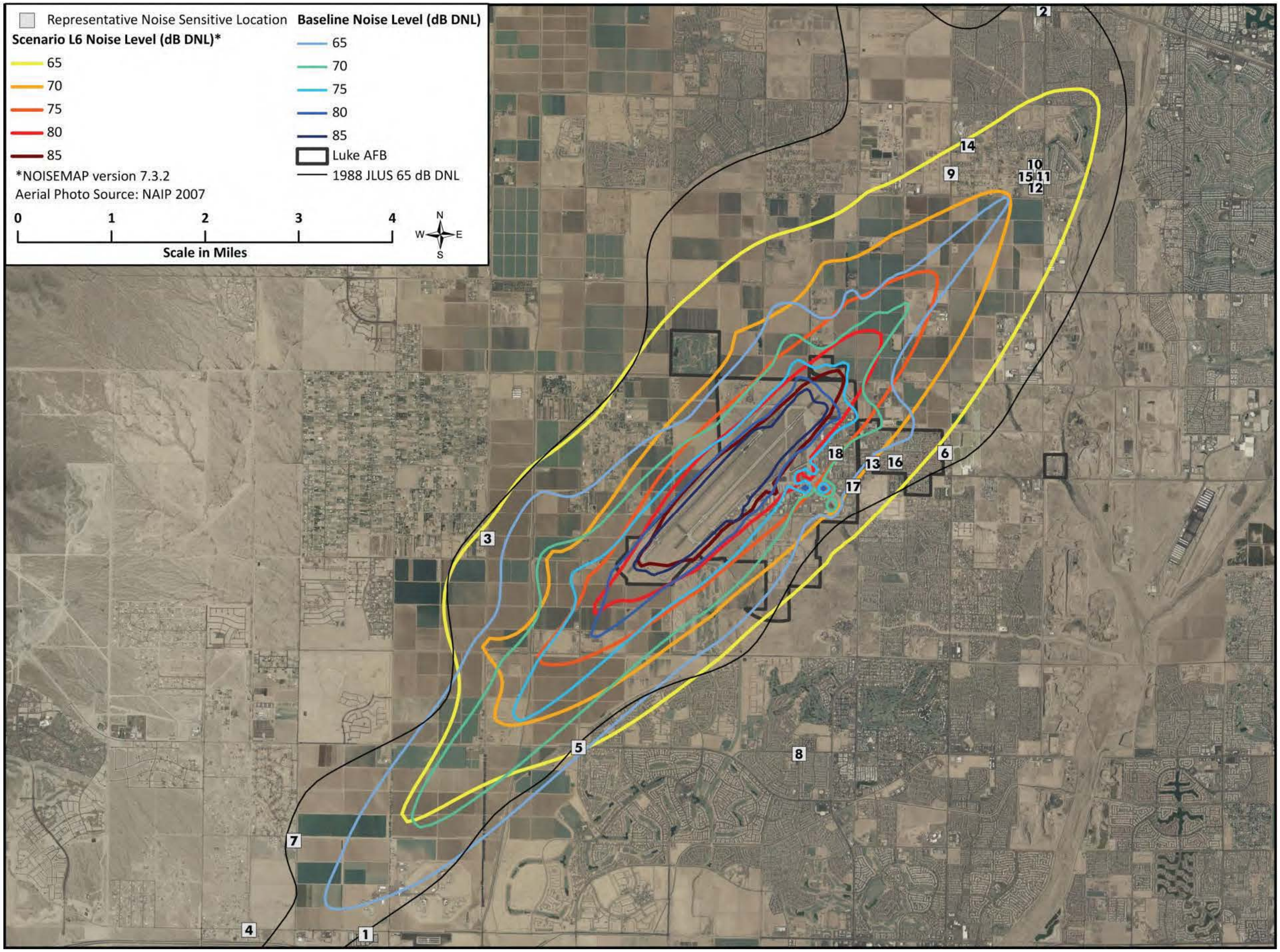


Figure LU 3.2–7. Scenario L6 and Baseline Noise Contours

Table LU 3.2–1. Population and Acreage Under Noise Contours Near Luke AFB, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation)*		*Population Affected (On-Installation)*		*Total Area Affected (Off-Installation)*		*Total Area Affected (On-Installation)*	
	Number	**Change**	**Number**	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions								
Total ≥ 65	**1,601**	**N/A**	**919**	**N/A**	**7,042**	**N/A**	**2,302**	**N/A**
65–69	1,535	N/A	728	N/A	3,903	N/A	401	N/A
70–74	50	N/A	191	N/A	2,107	N/A	397	N/A
75–79	14	N/A	0	N/A	859	N/A	404	N/A
80–84	2	N/A	0	N/A	173	N/A	402	N/A
≥ 85	0	N/A	0	N/A	0	N/A	698	N/A
Scenario L1 (24 Aircraft)								
Total ≥ 65	**200**	**(1,401)**	**766**	**(153)**	**4,763**	**(2,279)**	**2,247**	**(55**)
65–69	149	(1,386)	638	(90)	3,173	(730)	425	24
70–74	38	(12)	128	(63)	1,309	(798)	413	16
75–79	13	(1)	0	0	278	(581)	516	112
80–84	0	(2)	0	0	3	(170)	371	(31
≥ 85	0	0	0	0	0	0	522	(176)
Scenario L2 (48 Aircraft)								
Total ≥ 65	**488**	**(1,113)**	**919**	**0**	**6,407**	**(635)**	**2,450**	**148**
65–69	415	(1,120)	472	(256)	4,078	175	483	82
70–74	50	0	447	256	1,744	(363)	420	23
75–79	21	7	0	0	561	(298)	484	80
80–84	2	0	0	0	24	(149)	443	41
≥ 85	0	0	0	0	0	0	620	(78)
Scenario L3 (72 Aircraft)								
Total ≥ 65	**1,181**	**(420)**	**1,021**	**102**	**7,916**	**874**	**2,628**	**326**
65–69	1,090	(445)	319	(409)	4,903	1,000	563	162
70–74	59	9	702	511	2,135	28	426	29
75–79	26	12	0	0	799	(60)	452	48
80–84	6	4	0	0	79	(94)	479	77
≥ 85	0	0	0	0	0	0	708	10
Scenario L4 (96 Aircraft)								
Total ≥ 65	**2,223**	**622**	**1,174**	**255**	**9,398**	**2,356**	**2,705**	**403**
65–69	2,111	576	408	(320)	5,749	1,846	559	158
70–74	71	21	702	511	2,488	381	435	38
75–79	32	18	32	32	1,010	151	424	20
80–84	9	7	0	0	151	(22)	502	100
≥ 85	0	0	0	0	0	0	785	87
Scenario L5 (120 Aircraft)								
Total ≥ 65	**3,216**	**1,615**	**1,378**	**459**	**10,679**	**3,637**	**2,769**	**467**
65–69	3,078	1,543	638	(90)	6,420	2,517	555	154
70–74	88	38	128	(63)	2,816	709	443	46
75–79	38	24	64	64	1,203	344	413	9
80–84	12	10	0	0	237	64	502	100
≥ 85	0	0	0	0	3	3	856	158
Scenario L6 (144 Aircraft)								
Total ≥ 65	**5,340**	**3,739**	**1,582**	**663**	**11,651**	**4,609**	**2,827**	**525**
65–69	5,158	3,623	796	68	6,793	2,890	560	159
70–74	125	75	594	403	3,154	1,047	442	45
75–79	42	28	192	192	1,367	508	410	6
80–84	15	13	0	0	332	159	496	94
≥ 85	0	0	0	0	5	5	919	221

Note: (Number) denotes a negative number.

As depicted on Figures LU 3.2–1 through LU 3.2–7, there are areas both inside and outside the JLUS line which have been, are, or could be subject to 65 dB DNL noise levels. Table LU 3.2–2 presents the calculated 2010 census number of people and acreage within the JLUS state-designated high noise area, which would expect to experience 65 dB DNL noise levels. There are 27,545 people living within the high noise level JLUS line. The 65 dB DNL contour for No Action and F-35A basing Scenarios L1, L2, L3, L4, L5, and L6 results in off-installation people being subject to 65 dB DNL or above DNL noise levels. No off-installation people outside the JLUS line are expected to be within the 65 dB DNL contour under Scenarios L1, L2, or L3. F-35A basing Scenarios L4, L5, and L6 would result in 27, 372, or 749, respectively, off-installation people who currently reside outside the JLUS line but would be within the 65 dB DNL contour under the basing scenarios. Of these people, 1 person, 193 persons, and 515 persons reside outside of both the baseline 65 dB DNL contour and the JLUS line but within the 65 dB DNL contour under basing Scenarios L4, L5, and L6, respectively. As demonstrated by Table LU 3.2–2, approximately 86.0 to 98.7 percent of the people impacted by 65 dB DNL contours under Scenarios L4 to L6 already reside within the state-designated high noise 65 dB DNL contour. Off-installation populations were estimated by proportioning the area of the census blocks affected by noise contours. This method counts permanent residents only, and does not estimate persons residing in hotels and other temporary accommodations. On-installation populations reflect current residential unit occupancy data. The total accompanied housing population was estimated assuming an average of 2.2 dependents per housed military member. The residential population within each noise level increment was estimated by proportioning the area of the accompanied housing area affected by each noise level increment. The total dormitory population was distributed evenly among dormitory buildings to yield an estimated number of dorm residents affected by each noise level increment.

Table LU 3.2–2. F-35A >65 dB DNL Noise Contours Compared to JLUS

	People Off-Installation		***Acreage Off-Installation***		***People Off-Installation Within >65 dB DNL Noise Contours and Outside JLUS Line***	***Acreage Off-Installation Within >65 dB DNL Noise Contours and Outside JLUS Line***
	No.	***JLUS Minus F-35A 65 dB DNL***	***Acres***	***JLUS Minus F-35A 65 dB DNL***	***No.***	***Acres***
JLUS Line	27,545	N/A	19,461	N/A	N/A	N/A
Scenario L1 (24 Aircraft)	200	27,345	4,763	14,698	0	0
Scenario L2 (48 Aircraft)	488	27,057	6,407	13,054	0	0
Scenario L3 (72 Aircraft)	1,181	26,364	7,916	11,545	0	7
Scenario L4 (96 Aircraft)	2,223	25,322	9,398	10,063	27	34
Scenario L5 (120 Aircraft)	3,216	24,329	10,679	8,782	372	117
Scenario L6 (144 Aircraft)	5,340	22,205	11,651	7,810	749	252

Table LU 3.2–3 lists noise levels (SEL) associated with individual F-16C and F-35A aircraft overflights at a single location on the ground for purposes of comparison. The locations of aircraft ground tracks, as well as aircraft altitudes, airspeeds, and engine power settings used in this analysis, are representative of current F-16C or projected F-35A operations based on pilot input. Noise levels were generated using NOISEMAP Version 7.3 and the same aircraft operations data used to generate time-averaged noise levels (DNL contours) presented in this section. Note that actual overflight noise levels vary from flight to flight due to variations in aircraft location and configuration, as well as weather conditions and other factors. Under baseline conditions and beddown scenarios, aircraft sometimes fly in groups known as "formations." Since SEL is an exposure-based metric, doubling the number of aircraft flying overhead results in a combined SEL that is 3 dB higher than the individual overflights. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL as listed in Table LU 3.2–3. Cotton Lane Community Church was selected as the reference point location for the analysis because it is near frequently used F-16C and proposed F-35A flight paths. At the church, a typical F-35A afterburner departure operation would generate an SEL that is approximately 2 dB higher than that generated by afterburner departure of an F-16C equipped with the Pratt and Whitney 229 (PW-229) engine. The same F-35A afterburner departure would be approximately 5 dB louder than an afterburner departure of an F-16C equipped with the Pratt and Whitney 220 (PW-220) engine. The difference between F-35A military power departure SEL and F-16C military power departure SEL at the church would be 4 dB if the F-16C were equipped with a PW-229 engine and 6 dB if the F-16C were equipped with a PW-220 engine. A typical F-35A arrival operation would generate an SEL approximately 13 dB higher than an F-16C equipped with the PW-229 engine and 15 dB higher than an F-16C equipped with the PW-220 engine. While maneuvering in the traffic pattern, a typical F-35A closed pattern operation would generate an SEL approximately 3 dB higher than an F-16C equipped with the PW-229 engine and 9 dB higher than an F-16C equipped with a PW-220 engine. Noise levels generated by aircraft participating in Operation Snowbird at Davis-Monthan AFB are variable depending on the type of aircraft and other factors and are not listed in Table LU 3.2–3. Fighter aircraft noise levels are typically comparable to the F-16C noise levels listed in Table LU 3.2–3.

Table LU 3.2–3. Projected Noise Levels from Currently Based and F-35A Aircraft at a Specific Location on the Ground

Aircraft	*Engine*	*Operation Type*	*Engine Power*	*Airspeed (knots)*	*Altitude (feet AGL)*	*Slant Distance (feet)*	*SEL (dB)*
F-16C (Military power)	F100-PW-229	Departure	93% NC	145	985	8,193	88
F-16C (Afterburner power)	F100-PW-229		93% NC	300	1,064	8,202	90
F-16C (Military power)	F100-PW-220		92.4% NC	145	985	8,193	86
F-16C (Afterburner power)	F100-PW-220		92.4% NC	300	1,064	8,202	87
F-35A (Military power)	F-135PP		100% ETR	300	2,187	8,441	92
F-35A (Afterburner power)	F-135PP		100% ETR	300	2,230	8,444	92
F-16C	F100-PW-229	Arrival	78% NC	150	258	7,168	66
F-16C	F100-PW-220		78% NC	150	266	7,168	64
F-35A	F-135PP		40% ETR	180	335	7,171	79
F-16C	F100-PW-229	Closed Pattern	85% NC	210	1,509	1,485	92
F-16C	F100-PW-220		80% NC	210	1,510	1,486	86
F-35A	F-135PP		40% ETR	210	1,437	1,437	95

Note: Noise levels presented were calculated at Cotton Lane Community Church for the representative departure, arrival, or closed pattern flight that comes closest to the location. Actual individual overflight noise levels vary from the noise levels listed because of variations in aircraft configuration, flight track, altitude, and atmospheric conditions. Representative noise levels were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate noise contours.
Key: ETR=engine thrust request; NC=core engine speed.

Table LU 3.2–4 lists noise levels at several representative noise-sensitive locations under baseline conditions and Scenarios L1 through L6. Representative locations include all on-installation schools, hospitals, and places of worship. Off-installation representative noise-sensitive locations include schools, hospitals, and places of worship that could be found in publicly available databases that lie within the 65 dB DNL noise contour line under any scenario. The locations are referred to as "representative" because the list is not intended to include all facilities that could be considered schools, hospitals, or places of worship. Many facilities accommodate several functions and therefore may not be classified as a school, hospital, or place of worship in publicly available databases. Furthermore, new facilities may open and old facilities may close, making it difficult to establish an all-inclusive list. Descriptions of noise levels at the representative noise-sensitive locations also provide information relevant to surrounding land uses. For this reason, all noise metrics were calculated for all locations studied, even though some metrics are not directly relevant to a specific facility listed. For example, the percentage of persons awakened at least once per night is not directly relevant to a school or place of worship, but is relevant to residential areas, which tend to be located near schools and places of worship.

Table LU 3.2–4. Noise Levels at Representative Noise-Sensitive Locations, Baseline Conditions and F-35A Beddown Scenarios

ID No.	*General Description*[1]	*Outdoor DNL*[2]		*Events ≥ 50 dB L_{max} per "daytime" hour (windows open)*[2]		*Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)*[2]		*Outdoor $L_{eq(SD)}$*[2]		*Percentage Awakened (windows open)*[2]		*Percentage Awakened (windows closed)*[2]	
Baseline Conditions													
1	Residential Area No. 1	62		8		7		64		3		2	
2	Bill Gentry Baseball Park	53		6		1		55		11		0	
3	Cotton Lane Community Church	63		11		10		65		2		1	
4	Residential Area No. 2	63		8		7		64		3		2	
5	Residential Area No. 3	66		11		8		68		3		2	
6	Luke Elementary School	57		11		8		59		2		1	
7	Scott L Libby Elementary School	60		8		7		62		3		1	
8	Western Sky Middle School	52		11		3		54		1		1	
9	Desert Cove Assembly	56		8		1		58		15		1	
10	Jehovah's Witnesses Kingdom Hall	64		7		3		64		25		16	
11	Sun Valley Mennonite Church	63		7		2		63		23		15	
12	Sunset View Baptist Church	63		7		2		63		23		15	
13	U.S. Air Force Hospital	64		11		11		66		5		2	
14	Dysart Elementary School	55		7		1		56		14		1	
15	Sun Valley Christian School	64		7		3		64		24		16	
16	Child Development Center	62		11		11		63		5		1	
17	Chapel Center	66		11		11		67		3		2	
18	Base Chapel	70		17		11		72		13		2	
Scenario L1 (24 Aircraft)													
1	Residential Area No. 1	55	(-7)	3	(-5)	2	(-5)	57	(-7)	2	(-1)	1	(-1)
2	Bill Gentry Baseball Park	57	(4)	3	(-3)	2	(1)	59	(4)	0	(-11)	0	(0)
3	Cotton Lane Community Church	60	(-3)	6	(-5)	4	(-6)	63	(-2)	1	(-1)	0	(-1)
4	Residential Area No. 2	55	(-8)	3	(-5)	2	(-5)	57	(-7)	2	(-1)	1	(-1)
5	Residential Area No. 3	60	(-6)	5	(-6)	3	(-5)	62	(-6)	2	(-1)	0	(-2)
6	Luke Elementary School	58	(1)	5	(-6)	4	(-4)	60	(1)	0	(-2)	0	(-1)
7	Scott L Libby Elementary School	53	(-7)	3	(-5)	1	(-6)	55	(-7)	2	(-1)	1	(0)
8	Western Sky Middle School	48	(-4)	4	(-7)	2	(-1)	50	(-4)	0	(-1)	0	(-1)
9	Desert Cove Assembly	61	(5)	5	(-3)	3	(2)	63	(5)	0	(-15)	0	(-1)
10	Jehovah's Witnesses Kingdom Hall	65	(1)	4	(-3)	3	(0)	67	(3)	1	(-24)	1	(-15)
11	Sun Valley Mennonite Church	64	(1)	4	(-3)	3	(1)	66	(3)	1	(-22)	1	(-14)
12	Sunset View Baptist Church	64	(1)	4	(-3)	3	(1)	66	(3)	1	(-22)	1	(-14)
13	U.S. Air Force Hospital	64	(0)	5	(-6)	4	(-7)	66	(0)	0	(-5)	0	(-2)
14	Dysart Elementary School	60	(5)	4	(-3)	2	(1)	62	(6)	0	(-14)	0	(-1)
15	Sun Valley Christian School	65	(1)	4	(-3)	3	(0)	67	(3)	1	(-23)	1	(-15)
16	Child Development Center	62	(0)	5	(-6)	4	(-7)	64	(1)	0	(-5)	0	(-1)
17	Chapel Center	64	(-2)	5	(-6)	4	(-7)	67	(0)	0	(-3)	0	(-2)
18	Base Chapel	70	(0)	5	(-12)	5	(-6)	72	(0)	0	(-13)	0	(-2)

ID No.	General Description[1]	Outdoor DNL[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]		Outdoor $L_{eq(SD)}$[2]		Percentage Awakened (windows open)[2]		Percentage Awakened (windows closed)[2]	
Scenario L2 (48 Aircraft)													
1	Residential Area No. 1	56	(-6)	4	(-4)	3	(-4)	58	(-6)	2	(-1)	1	(-1)
2	Bill Gentry Baseball Park	58	(5)	5	(-1)	3	(2)	60	(5)	0	(-11)	0	(0)
3	Cotton Lane Community Church	62	(-1)	8	(-3)	6	(-4)	64	(-1)	1	(-1)	0	(-1)
4	Residential Area No. 2	55	(-8)	4	(-4)	3	(-4)	57	(-7)	2	(-1)	1	(-1)
5	Residential Area No. 3	62	(-4)	8	(-3)	5	(-3)	64	(-4)	2	(-1)	0	(-2)
6	Luke Elementary School	60	(3)	7	(-4)	5	(-3)	62	(3)	0	(-2)	0	(-1)
7	Scott L Libby Elementary School	54	(-6)	4	(-4)	2	(-5)	56	(-6)	2	(-1)	1	(0)
8	Western Sky Middle School	50	(-2)	5	(-6)	3	(0)	52	(-2)	0	(-1)	0	(-1)
9	Desert Cove Assembly	63	(7)	7	(-1)	5	(4)	65	(7)	0	(-15)	0	(-1)
10	Jehovah's Witnesses Kingdom Hall	66	(2)	6	(-1)	4	(1)	68	(4)	1	(-24)	1	(-15)
11	Sun Valley Mennonite Church	65	(2)	6	(-1)	4	(2)	67	(4)	1	(-22)	1	(-14)
12	Sunset View Baptist Church	65	(2)	6	(-1)	4	(2)	67	(4)	1	(-22)	1	(-14)
13	U.S. Air Force Hospital	66	(2)	7	(-4)	6	(-5)	68	(2)	0	(-5)	0	(-2)
14	Dysart Elementary School	62	(7)	6	(-1)	4	(3)	64	(8)	0	(-14)	0	(-1)
15	Sun Valley Christian School	66	(2)	6	(-1)	4	(1)	68	(4)	1	(-23)	1	(-15)
16	Child Development Center	64	(2)	7	(-4)	6	(-5)	66	(3)	0	(-5)	0	(-1)
17	Chapel Center	66	(0)	7	(-4)	6	(-5)	68	(1)	0	(-3)	0	(-2)
18	Base Chapel	72	(2)	8	(-9)	7	(-4)	74	(2)	0	(-13)	0	(-2)
Scenario L3 (72 Aircraft)													
1	Residential Area No. 1	56	(-6)	6	(-2)	4	(-3)	58	(-6)	2	(-1)	1	(-1)
2	Bill Gentry Baseball Park	59	(6)	7	(1)	4	(3)	61	(6)	1	(-10)	0	(0)
3	Cotton Lane Community Church	64	(1)	11	(0)	9	(-1)	66	(1)	1	(-1)	0	(-1)
4	Residential Area No. 2	56	(-7)	6	(-2)	4	(-3)	58	(-6)	2	(-1)	1	(-1)
5	Residential Area No. 3	63	(-3)	10	(-1)	6	(-2)	65	(-3)	2	(-1)	0	(-2)
6	Luke Elementary School	61	(4)	9	(-2)	6	(-2)	64	(5)	0	(-2)	0	(-1)
7	Scott L Libby Elementary School	54	(-6)	6	(-2)	3	(-4)	56	(-6)	2	(-1)	1	(0)
8	Western Sky Middle School	51	(-1)	7	(-4)	5	(2)	54	(0)	0	(-1)	0	(-1)
9	Desert Cove Assembly	65	(9)	9	(1)	7	(6)	67	(9)	1	(-14)	0	(-1)
10	Jehovah's Witnesses Kingdom Hall	67	(3)	8	(1)	5	(2)	69	(5)	1	(-24)	1	(-15)
11	Sun Valley Mennonite Church	66	(3)	8	(1)	5	(3)	68	(5)	1	(-22)	1	(-14)
12	Sunset View Baptist Church	66	(3)	8	(1)	5	(3)	68	(5)	1	(-22)	1	(-14)
13	U.S. Air Force Hospital	67	(3)	9	(-2)	8	(-3)	69	(3)	0	(-5)	0	(-2)
14	Dysart Elementary School	63	(8)	8	(1)	5	(4)	65	(9)	1	(-13)	0	(-1)
15	Sun Valley Christian School	67	(3)	8	(1)	5	(2)	69	(5)	1	(-23)	1	(-15)
16	Child Development Center	65	(3)	9	(-2)	7	(-4)	67	(4)	0	(-5)	0	(-1)
17	Chapel Center	67	(1)	10	(-1)	8	(-3)	70	(3)	0	(-3)	0	(-2)
18	Base Chapel	73	(3)	10	(-7)	9	(-2)	76	(4)	1	(-12)	0	(-2)

ID No.	General Description[1]	Outdoor DNL[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]		Outdoor $L_{eq(SD)}$[2]		Percentage Awakened (windows open)[2]		Percentage Awakened (windows closed)[2]	
Scenario L4 (96 Aircraft)													
1	Residential Area No. 1	57	(-5)	7	(-1)	5	(-2)	59	(-5)	3	(0)	2	(0)
2	Bill Gentry Baseball Park	60	(7)	9	(3)	6	(5)	62	(7)	1	(-10)	1	(1)
3	Cotton Lane Community Church	65	(2)	13	(2)	11	(1)	67	(2)	2	(0)	1	(0)
4	Residential Area No. 2	57	(-6)	7	(-1)	5	(-2)	59	(-5)	3	(0)	2	(0)
5	Residential Area No. 3	64	(-2)	13	(2)	8	(0)	66	(-2)	3	(0)	1	(-1)
6	Luke Elementary School	63	(6)	11	(0)	8	(0)	65	(6)	1	(-1)	0	(-1)
7	Scott L Libby Elementary School	55	(-5)	7	(-1)	4	(-3)	57	(-5)	3	(0)	1	(0)
8	Western Sky Middle School	52	(0)	8	(-3)	6	(3)	55	(1)	1	(0)	0	(-1)
9	Desert Cove Assembly	66	(10)	11	(3)	8	(7)	68	(10)	1	(-14)	1	(0)
10	Jehovah's Witnesses Kingdom Hall	67	(3)	9	(2)	6	(3)	69	(5)	2	(-23)	1	(-15)
11	Sun Valley Mennonite Church	67	(4)	9	(2)	6	(4)	69	(6)	2	(-21)	1	(-14)
12	Sunset View Baptist Church	67	(4)	9	(2)	6	(4)	69	(6)	2	(-21)	1	(-14)
13	U.S. Air Force Hospital	68	(4)	12	(1)	10	(-1)	70	(4)	1	(-4)	0	(-2)
14	Dysart Elementary School	64	(9)	10	(3)	6	(5)	66	(10)	1	(-13)	1	(0)
15	Sun Valley Christian School	67	(3)	9	(2)	6	(3)	69	(5)	2	(-22)	1	(-15)
16	Child Development Center	66	(4)	12	(1)	9	(-2)	68	(5)	1	(-4)	0	(-1)
17	Chapel Center	68	(2)	12	(1)	10	(-1)	70	(3)	1	(-2)	0	(-2)
18	Base Chapel	74	(4)	12	(-5)	11	(0)	76	(4)	2	(-11)	0	(-2)
Scenario L5 (120 Aircraft)													
1	Residential Area No. 1	58	(-4)	9	(1)	5	(-2)	59	(-5)	4	(1)	2	(0)
2	Bill Gentry Baseball Park	61	(8)	11	(5)	7	(6)	63	(8)	2	(-9)	1	(1)
3	Cotton Lane Community Church	65	(2)	16	(5)	13	(3)	68	(3)	2	(0)	1	(0)
4	Residential Area No. 2	58	(-5)	8	(0)	6	(-1)	59	(-5)	5	(2)	3	(1)
5	Residential Area No. 3	65	(-1)	15	(4)	10	(2)	67	(-1)	4	(1)	2	(0)
6	Luke Elementary School	63	(6)	14	(3)	9	(1)	65	(6)	1	(-1)	1	(0)
7	Scott L Libby Elementary School	56	(-4)	9	(1)	4	(-3)	57	(-5)	4	(1)	2	(1)
8	Western Sky Middle School	53	(1)	9	(-2)	7	(4)	55	(1)	1	(0)	0	(-1)
9	Desert Cove Assembly	66	(10)	13	(5)	10	(9)	68	(10)	2	(-13)	1	(0)
10	Jehovah's Witnesses Kingdom Hall	68	(4)	11	(4)	8	(5)	70	(6)	3	(-22)	2	(-14)
11	Sun Valley Mennonite Church	68	(5)	11	(4)	7	(5)	70	(7)	3	(-20)	2	(-13)
12	Sunset View Baptist Church	68	(5)	11	(4)	7	(5)	70	(7)	3	(-20)	2	(-13)
13	U.S. Air Force Hospital	69	(5)	14	(3)	11	(0)	71	(5)	2	(-3)	1	(-1)
14	Dysart Elementary School	65	(10)	12	(5)	7	(6)	67	(11)	2	(-12)	1	(0)
15	Sun Valley Christian School	68	(4)	11	(4)	8	(5)	70	(6)	3	(-21)	2	(-14)
16	Child Development Center	67	(5)	14	(3)	10	(-1)	69	(6)	2	(-3)	1	(0)
17	Chapel Center	69	(3)	14	(3)	11	(0)	71	(4)	2	(-1)	1	(-1)
18	Base Chapel	75	(5)	15	(-2)	14	(3)	44	(-28)	3	(-10)	1	(-1)

ID No.	General Description[1]	Outdoor DNL[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows open) [2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows closed) [2]		Outdoor $L_{eq(SD)}$[2]		Percentage Awakened (windows open)[2]		Percentage Awakened (windows closed)[2]	
Scenario L6 (144 Aircraft)													
1	Residential Area No. 1	58	(-4)	10	(2)	6	(-1)	60	(-4)	6	(3)	4	(2)
2	Bill Gentry Baseball Park	62	(9)	12	(6)	8	(7)	63	(8)	3	(-8)	2	(2)
3	Cotton Lane Community Church	66	(3)	18	(7)	15	(5)	68	(3)	4	(2)	2	(1)
4	Residential Area No. 2	58	(-5)	10	(2)	8	(1)	60	(-4)	6	(3)	4	(2)
5	Residential Area No. 3	65	(-1)	18	(7)	11	(3)	67	(-1)	5	(2)	3	(1)
6	Luke Elementary School	64	(7)	16	(5)	11	(3)	66	(7)	2	(0)	1	(0)
7	Scott L Libby Elementary School	57	(-3)	10	(2)	5	(-2)	58	(-4)	5	(2)	3	(2)
8	Western Sky Middle School	54	(2)	11	(0)	9	(6)	56	(2)	2	(1)	0	(-1)
9	Desert Cove Assembly	67	(11)	15	(7)	12	(11)	69	(11)	3	(-12)	2	(1)
10	Jehovah's Witnesses Kingdom Hall	69	(5)	13	(6)	9	(6)	70	(6)	5	(-20)	3	(-13)
11	Sun Valley Mennonite Church	68	(5)	13	(6)	9	(7)	70	(7)	5	(-18)	3	(-12)
12	Sunset View Baptist Church	68	(5)	13	(6)	9	(7)	70	(7)	4	(-19)	3	(-12)
13	U.S. Air Force Hospital	70	(6)	16	(5)	13	(2)	72	(6)	3	(-2)	1	(-1)
14	Dysart Elementary School	66	(11)	14	(7)	8	(7)	68	(12)	3	(-11)	2	(1)
15	Sun Valley Christian School	69	(5)	13	(6)	9	(6)	70	(6)	5	(-19)	3	(-13)
16	Child Development Center	68	(6)	16	(5)	12	(1)	70	(7)	3	(-2)	1	(0)
17	Chapel Center	70	(4)	16	(5)	13	(2)	72	(5)	4	(1)	1	(-1)
18	Base Chapel	76	(6)	17	(0)	16	(5)	78	(6)	5	(-8)	2	(0)

[1] Locations presented in this table are provided to help understand the noise environment. This list is not meant to be inclusive of all noise-sensitive receptors in the affected environment.
[2] Numbers in parentheses indicate delta relative to baseline conditions.

Under Scenario L1, noise levels at all of the representative locations would be below 65 dB DNL except at the Jehovah's Witnesses Kingdom Hall (Location No. 10), the Sun Valley Christian School (Location No. 15), and the base chapel (Location No. 18). Changes in DNL at the representative noise-sensitive locations relative to baseline conditions would range from decreases of up to 8 dB to increases of up to 5 dB. The wide range of noise level changes at the various locations is primarily a result of predicted increases in the percentage of total sorties departing to the north. Increases in instantaneous noise levels of 3 to 10 dB are typically described as "noticeable," and increases of greater than or equal to 10 dB are typically described as "more than twice as loud." Under Scenarios L2, L3, L4, L5, and L6, 7, 9, 10, 12, and 12 of the 18 noise-sensitive locations studied would exceed 65 DNL. Among all locations studied, the average number of indoor noise events per hour exceeding 50 dB L_{max} would decrease under Scenarios L1, L2, and L3 with windows open. If windows are open, the average number of events among all locations studied would increase by 8 percent, 30 percent and 50 percent under Scenarios L4, L5, and L6, respectively. If windows are closed, the average number of events exceeding 50 dB L_{max} among all locations studied would decrease under Scenarios L1 and L2 but would increase under Scenarios L3, L4, L5, and L6 by 7, 22, 44, and 71 percent, respectively (see Table LU 3.2–4).

Under Scenarios L1 and L2, of the schools studied, only the Sun Valley Christian School (Location No. 15) would exceed 65 dB $L_{eq(SD)}$. Under Scenario L3, the noise level at Location No. 15 and Dysart Elementary School (Location No. 14) would exceed 65 dB $L_{eq(SD)}$. The noise levels at Luke Elementary School (Location No. 6), Dysart Elementary School, and the Sun Valley Christian School would exceed 65 dB $L_{eq(SD)}$ under Scenarios L4, L5, and L6. Assuming that a typical school structure provides 25 dB noise level reduction (NLR) with windows closed, schools experiencing an outdoor $L_{eq(SD)}$ exceeding 65 dB $L_{eq(SD)}$ may not meet the 2009 American National Standards Institute (ANSI) standard. F-35A operational schedules are not known at this time. In a hypothetical hour with twice the average daytime number of operations, L_{eq} would be 3 dB higher than the $L_{eq(SD)}$ listed in Table LU 3.2–4. Actual outdoor-to-indoor NLR varies from school to school and between locations within individual schools.

The percentage of persons awakened from sleep by aircraft noise was estimated using the methodology described in Chapter 3, Section 3.2, for "windows open" and "windows closed" conditions. The F-35A is expected to conduct relatively few airfield operations at night (see Section LU 2.1.1), and the calculated percentage of persons awakened at least once per night would decrease under all scenarios averaged among all of the locations studied.

F-35A training at active-duty Air Force locations would not be expected to take place on the weekend (i.e., Saturday or Sunday). However, mission requirements would dictate the flying schedule. Other weekend flying and ANG weekend training is expected to continue at its current rate.

The risk of hearing loss under the beddown scenarios was assessed using the methodology described in Chapter 3, Section 3.2, and in greater detail in Appendix B. Under Scenarios L1 and L2, the number of off-installation residents exposed to noise levels greater than 80 dB DNL would decrease. Under Scenarios L3, L4, L5, and L6, the estimated number of off-installation residents affected by noise levels greater than 80 dB DNL would increase from 2 to 5, 8, 12, and 14 persons, respectively (see Table LU 3.2–5). Persons exposed to noise at greater than 80 dB DNL would have an increased likelihood of experiencing noise-induced permanent threshold shift (NIPTS), as shown in Chapter 3, Table 3–4. As an example, under Scenario L4, it is estimated that two individuals reside within the 82–83 dB DNL contour surrounding Luke AFB. If these individuals have an average response to noise, then they may experience as much as a 4 dB NIPTS in hearing were the individuals to remain in that location every day for 8 hours per day for 40 years and be fully exposed to the noise level at their residences (i.e., no time is spent indoors). If the same individuals spend the national average percentage of their total day indoors (87 percent), then the individuals would be expected to experience no more than 1 dB NIPTS in hearing. If the individuals were particularly sensitive, they could experience up to a 9 dB NIPTS if they were fully exposed to noise and up to 3.5 dB NIPTS if they spend the national average percentage of their day indoors. PHL risk among workers on Luke AFB would be evaluated using the appropriate DoD component regulations for occupational noise exposure. The number of on-base structures that would be affected by noise levels greater than 80 dB DNL would decrease from 43 under baseline conditions to 29 under Scenario L1 and 40 under Scenario L2. Under Scenarios L3, L4, L5, and L6, the number of structures would increase to 45, 53, 64, and 72, respectively. No residential structures on Luke AFB would be affected by noise levels greater than 80 dB DNL under any scenario.

As F-35A noise levels would not exceed 130 dB in any 1/3-octave frequency band at distances of greater than 250 feet, no damage to structures is expected to occur as a result of F-35A subsonic noise (CHABA 1977). The term 'frequency bands' refers to noise energy in a certain range of frequencies and is similar in concept to frequency bands employed on home stereo equalizers to control relative levels of bass and treble. Noise energy in certain frequency bands has increased potential to vibrate and/or damage structures. Furthermore, studies conducted on vibrations induced by subsonic aircraft overflights generating similar noise levels to the F-35A in ancient Anasazi ruins indicate that vibrations would not occur at or near potentially damaging levels. Additional discussion of the effects of noise on cultural resources and ancient fragile structures can be found in Section LU 3.9.

Table LU 3.2–5. Luke AFB Estimated Off-Installation Population Exposed to Noise Levels that Could Result in NIPTS, Baseline Conditions and F-35A Beddown Scenarios

Contour Band (dB DNL)	*Estimated Population*						
	Baseline Conditions	**Scenario L1 (24 Aircraft)**	**Scenario L2 (48 Aircraft)**	**Scenario L3 (72 Aircraft)**	**Scenario L4 (96 Aircraft)**	**Scenario L5 (120 Aircraft)**	**Scenario L6 (144 Aircraft)**
80–81	2	0	1	3	3	4	4
81–82	0	0	0	2	3	3	3
82–83	0	0	0	0	2	3	3
83–84	0	0	0	0	0	2	3
84–85	0	0	0	0	0	0	1
85–86	0	0	0	0	0	0	0
86–87	0	0	0	0	0	0	0
87–88	0	0	0	0	0	0	0
88–89	0	0	0	0	0	0	0
89–90	0	0	0	0	0	0	0
90–91	0	0	0	0	0	0	0
Total	**2**	**0**	**1**	**5**	**8**	**12**	**14**

Indirect impacts of noise on land use patterns could potentially occur, although it is impossible to predict exactly what form the impact would take. As discussed in detail in Section LU 3.10, implementation of certain scenarios would result in additional existing land uses becoming incompatible with noise due to the increase in noise level.

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include non-auditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines. More-specific discussions on noise effects on animal species can be found in Sections LU 3.6, LU 3.7, and LU 3.8.

Many factors affect the market value of real property. While qualities of the property itself, surrounding properties, and the local real estate market are clearly the primary determinants of value, ambient noise levels could also play a role in determining market value. The effect of ambient noise level on real property market value has been studied extensively, but results have

been contradictory. More-specific discussions on the effect of noise on real property market value can be found in Section LU 3.11.

Any claims from Air Force–related damage would begin by contacting the Luke AFB Public Affairs Office with details of the claim. The Air Force would then investigate to establish the exact nature and extent of the damage.

LU 3.2.2 Airspace

LU 3.2.2.1 Airspace Affected Environment

Within MOAs, ATCAAs, and Restricted Areas, training flights are typically widely dispersed and random. Flight operations are constrained only by the boundaries of the airspace and any restrictions on training in the form of designated avoidance areas. The Air Force has developed the MOA-Range NOISEMAP (MR_NMAP) program to calculate subsonic aircraft noise in these areas (Lucas and Calamia 1996). MR_NMAP can also calculate noise levels beneath MTRs where flight paths are restricted to a designated corridor. Subsonic aircraft noise levels associated with operations in the primary use airspace were calculated using MR_NMAP and are shown in Table LU 3.2–6. Noise was not explicitly computed for occasional use airspace because of the low amount of use. The number of operations conducted in these occasional use airspace units is so low that their influence on the cumulative noise is negligible. Areas beneath the Gladden, Bagdad, and Sells MOAs, as well as the areas beneath Visual Route 239 (VR-239), VR-245, VR-223, VR-231, VR-241, VR-242, VR-243, and VR-244 are exposed to noise levels below 55 dB DNL_{mr} under baseline conditions. The areas beneath the BMGR North, South, and East TAC and Air-to-Air Range airspace are affected by noise levels between 55 and 64 dB DNL_{mr}.

Each MTR includes several segments with defined beginning and ending locations, as well as a defined route corridor width to the right and to the left of the centerline. Studies of MTR operations show that operations are concentrated near the MTR centerline and spend relatively less time near the route corridor edges (Lucas and Plotkin 1988). MTR noise levels stated in this EIS are for a location beneath the MTR centerline in the narrowest segment of the MTR (i.e., the point of highest concentrations of overflights). Pilots often enter and exit MTRs at points along the route rather than at the beginning and end points, such that certain MTR segments may experience fewer annual sortie operations than indicated in Table LU 2.2–2.

Military aircraft are not the only source of sound under the airspace. Aircraft noise must be compared with background or "ambient" noise, as well as evaluated on an absolute basis. Ambient noise levels in a quiet residential setting are approximately 45 dB DNL (EPA 1974). The vast majority of the airspace ROI consists of rural areas in which noise levels would be below 45 dB DNL. In those areas where military aircraft noise levels would be less than 45 dB DNL_{mr}, military aircraft noise could be noticed but would not add appreciably to overall noise levels. Noise levels in such airspace units are simply listed in Table LU 3.2–6 as "< 45."

Table LU 3.2–6. Noise Environment for Luke AFB Primary Use Airspace, Baseline Conditions and F-35A Beddown Scenarios

Airspace Name[1]	*Baseline Conditions*			*Scenario L1 (24 Aircraft)*			*Scenario L2 (48 Aircraft)*			*Scenario L3 (72 Aircraft)*			*Scenario L4 (96 Aircraft)*			*Scenario L5 (120 Aircraft)*			*Scenario L6 (144 Aircraft)*		
	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day
Gladden / Bagdad MOAs	< 45	54	2.4	45	47	0.5	48	48	0.7	50	49	1	51	50	1	52	51	1	53	51	1
Sells MOA	< 45	54	2.3	< 45	51	1.1	47	51	1.3	49	52	1	50	52	2	51	53	2	52	53	2
R-2301E Air-to-Air Area	55	52	2.7	58	48	1.1	61	48	1.1	62	48	1	64	48	1	65	48	1	65	49	1
R-2301E BMGR North TAC Range	61	54	2.3	63	50	1	65	50	1	67	51	1	68	51	1	69	51	1	70	51	1
R-2301E BMGR South TAC Range	61	53	2.2	63	49	0.9	65	49	1	67	50	1	68	50	1	69	50	1	70	50	1
R-2304/ R-2305 BMGR East TAC Range	64	N/A	N/A	61	N/A	N/A	64	N/A	N/A	65	N/A	N/A	66	N/A	N/A	67	N/A	N/A	68	N/A	N/A
VR-239	< 45	N/A	N/A	54	N/A	N/A	57	N/A	N/A	58	N/A	N/A	60	N/A	N/A	61	N/A	N/A	61	N/A	N/A
VR-245	< 45	N/A	N/A	54	N/A	N/A	57	N/A	N/A	58	N/A	N/A	60	N/A	N/A	61	N/A	N/A	61	N/A	N/A
VR-223	47	N/A	N/A	49	N/A	N/A	52	N/A	N/A	53	N/A	N/A	55	N/A	N/A	55	N/A	N/A	56	N/A	N/A
VR-231	47	N/A	N/A	49	N/A	N/A	52	N/A	N/A	53	N/A	N/A	54	N/A	N/A	55	N/A	N/A	56	N/A	N/A
VR-241	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A	45	N/A	N/A	47	N/A	N/A	47	N/A	N/A	48	N/A	N/A
VR-242	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A	45	N/A	N/A	47	N/A	N/A	47	N/A	N/A	48	N/A	N/A
VR-243	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A	45	N/A	N/A	47	N/A	N/A	47	N/A	N/A	48	N/A	N/A
VR-244	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A	46	N/A	N/A	47	N/A	N/A	48	N/A	N/A	48	N/A	N/A

[1] Noise levels beneath MOAs listed also include noise generated by aircraft operating in overlying ATCAAs; airspace units in which supersonic noise levels are "N/A" are not authorized for supersonic flight.

Sonic boom noise levels and average number of sonic booms per day were calculated using the BOOMAP program. Under baseline conditions (see Table LU 3.2–6), sonic boom noise exposure levels do not exceed 62 dB CDNL under any primary use airspace unit. Areas near the center of each of the primary training airspace units in which supersonic training is permitted experience between 2 and 3 sonic booms per day on average. Supersonic flight is not authorized on MTRs or in the BMGR East TAC Range airspace.

LU 3.2.2.2 Airspace Environmental Consequences

Subsonic noise levels beneath the primary training airspace units under each of the beddown scenarios were calculated using MR_NMAP. Under all scenarios except Scenario L6, F-35A sortie-operations between 10:00 p.m. and 7:00 a.m. (the late-night period in which noise events are assessed a penalty as part of calculation of the DNL_{mr} metric) would be rare. The F-16 aircraft based at Luke AFB and other current users of the primary use training airspace conduct approximately 1 percent of sortie-operations between 10:00 p.m. and 7:00 a.m. Under Scenario L1, DNL_{mr} beneath Gladden, Bagdad, and Sells MOAs would not change, DNL_{mr} beneath the BMGR air-to-air training area and North/South TAC Range airspace would increase by 3 dB or less, and DNL_{mr} beneath the East TAC Range airspace would decrease by 3 dB. Noise impacts on humans resulting from noise level increases in BMGR TAC and Air-to-Air Ranges would be limited because the BMGR TAC range airspace is located entirely over unpopulated Federal land. DNL_{mr} increases of 9 dB would occur in areas beneath the centerlines of VR-239 and VR-245, but noise levels would remain below 65 dB DNL_{mr}. Noise levels beneath the centerlines of VR-223 and VR-231 would increase by 2 dB, and noise levels beneath the centerlines of VR-241, VR-242, VR-243, and VR-244 would remain less than 45 dB DNL_{mr}. Increases in subsonic noise levels under the F-35A beddown scenarios reflect the fact that the F-35A is louder than current users of the training airspace in typical airspace training flight configurations. To put these increases in time-averaged noise level (DNL_{mr}) in perspective, increases in instantaneous sound level of 3 to 10 dB are typically described as "noticeable," increases of 10 to 20 dB are typically described as "more than twice as loud," and increases of greater than 20 dB are typically described as "more than four times as loud." Increases in DNL_{mr}, particularly to levels greater than 65 dB DNL_{mr}, are expected to increase the percentage of persons highly annoyed by noise. DNL_{mr} beneath all primary training airspace units would remain below 65 dB under Scenario L1. Noise levels generated by overflight of F-35A aircraft and several other aircraft that use the training airspace frequently are shown in Table LU 3.2–7. For each aircraft type, the table shows SEL and, in parentheses, the SEL_r metric, which adds a decibel 'penalty' to events with fast onset rates that have an increased potential to surprise people.

Under baseline conditions and beddown scenarios, aircraft sometimes fly in groups known as "formations." Since SEL is an exposure-based metric, doubling the number of aircraft flying overhead results in a combined SEL that is 3 dB higher than the individual overflights. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL as listed in Table LU 3.2–7.

Table LU 3.2–7. Comparative Aircraft SEL_r Under the Flight Track for Aircraft at Various Vertical Distances (Feet AGL) in Training Airspace

Aircraft	*SEL (SEL_r) in dB*					*Power*	*Speed (knots)*
	500 AGL	*1,000 AGL*	*2,000 AGL*	*5,000 AGL*	*10,000 AGL*		
F-16[1]	116 (118)	111 (111)	104 (104)	94 (94)	86 (86)	104% NC	350
F-35A[2]	127 (128)	120 (120)	112 (112)	102 (102)	94 (94)	95% ETR	475
A-10	97 (97)	91 (91)	83 (83)	67 (67)	55 (55)	5333 NF	325
F-15	116 (121)	110 (111)	104 (104)	95 (95)	85 (85)	82% NC	550
F/A-18C/D	106 (107)	100 (100)	94 (94)	83 (83)	73 (73)	88% NC	400
F-22	124 (126)	119 (119)	113 (113)	104 (104)	95 (95)	100% ETR	300
T-38	115 (115)	109 (109)	101 (101)	89 (89)	78 (78)	100% RPM	299
Tornado	101 (102)	95 (95)	89 (89)	80 (80)	71 (71)	89% RPM	420
H-60	91 (91)	87 (87)	81 (81)	N/A	N/A	LFO Lite 140 Kts	140
F/A-18 E/F	116 (119)	111 (111)	105 (105)	95 (95)	86 (86)	83% N2	350
F-4C	114 (119)	109 (110)	103 (103)	93 (93)	83 (83)	98% RPM	550

[1] The F-16 engine is GE-100.
[2] The noise levels for the F-35A operating at high speeds were based on an empirical curve fit from the noise data contained in the NoiseFile database for these high-speed operations (Wyle 2010).
Note: Level flight, steady high-speed conditions. Used standard acoustical conditions (59 degrees Fahrenheit and 70 percent relative humidity).
Key: ETR=engine thrust request; N2=engine speed at position 2; NC=core engine speed; NF=fan speed; LFO Lite 140 Kts=helicopter in level flight at 140 knots; RPM=revolutions per minute.

Most F-35A training time is spent at high altitudes, with approximately 93 percent of total training time occurring above 5,000 AGL (see Chapter 2, Table 2–9). However, when conducting low-altitude training at high engine power settings, F-35A aircraft overflights generate noise levels exceeding 115 dB SEL. As discussed in Appendix B, Section B.2.5.1, studies suggest that individual noise events in excess of 115 dB can trigger a temporary shift in hearing threshold, although the findings conflict as to the extent of the shift and whether the shift is to an increased or decreased hearing sensitivity (Ising et al. 1999; West and Green 1994).

Flight data recorded during multiple low-altitude training flight simulator runs were used to estimate the average number of times per month that a location under the MTR centerline would be exposed to noise levels exceeding 115 dB. From the simulator data, it was found that 80 percent of the total time spent on an MTR was spent at aircraft engine power settings of 50 percent ETR or below, with the remainder of the time spent at higher engine power settings. Approximately 70 percent of total time was spent at altitudes between 500 and 750 feet AGL, with the remaining time being spent at altitudes between 750 and 1,500 feet AGL. A probability-based model, which is described in Appendix B, Section B.3, was used to combine data collected from flight simulator runs with expected MTR frequency of use data. On the narrowest segment of the most frequently used MTR under the scenario with the highest number of MTR sortie-operations (i.e., Scenario L6), an average of 10 overflights per month would exceed 115 dB at a particular point underneath the centerline of the MTR. The average frequency of noise levels exceeding 120 dB, the lower threshold for ear discomfort, would be substantially less. Low-altitude noise events are very brief, with the high noise levels typically lasting less than 4 seconds. NIPTS, otherwise known as hearing loss, typically occur when loud

events are repeated frequently such as occurs in a workplace environment. Infrequent loud events, such as the events that would occur with proposed F-35A low-altitude training, could be highly annoying, but would not be expected to result in NIPTS.

Under Scenario L2, DNL_{mr} beneath MOA and Restricted Area training airspace units would increase by up to 6 dB; DNL_{mr} would increase by up to 12 dB beneath the centerlines of VR-239 and VR-245 (see Table LU 3.2–6). Beneath the centerlines of VR-223 and VR-231, noise levels would increase by 5 dB DNL_{mr}, and beneath VR-241, VR-242, VR-243, and VR-244 noise levels would remain below 45 dB DNL_{mr}. DNL_{mr} would exceed 65 dB beneath the BMGR North and South TAC Range airspace units. Additional F-35A sortie-operations under Scenarios L3, L4, L5, and L6 would result in a further increase in DNL_{mr}. Under Scenario L3, DNL_{mr} beneath the primary training airspace units would increase by as much as 7 dB except beneath the centerlines of VR-239 and VR-245, where noise levels would increase by 13 dB. DNL_{mr} would exceed 65 dB beneath the BMGR TAC range airspace units under Scenario L3. Under Scenario L4, DNL_{mr} would increase by as much as 9 dB under the training airspace units, with the exception of VR-239 and VR-245, beneath the centerlines of which noise levels would increase by 15 dB. DNL_{mr} would exceed 65 dB in the same airspace units under Scenario L4 as under Scenario L3. Under Scenarios L5 and L6, DNL_{mr} would increase by up to 10 dB beneath training airspace units except beneath the centerlines of VR-239 and VR-245, where noise levels would increase by 16 dB. DNL_{mr} would exceed 65 dB beneath the BMGR TAC range airspace units and the BMGR Air-to-Air training airspace under Scenarios L5 and L6.

F-35A training at active-duty Air Force locations would not be expected to take place on the weekend (i.e., Saturday or Sunday). However, mission requirements would dictate the flying schedule. Other weekend flying and ANG weekend training is expected to continue at its current rate.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training. The amplitude of an individual sonic boom is measured by its peak overpressure, in pounds per square foot, and depends on an aircraft's size, weight, geometry, Mach number, and flight altitude. Table LU 3.2–8 shows sonic boom peak overpressures for direct overflight of F-16C, F-15, and F-35A aircraft at Mach 1.2 in straight and level flight at various altitudes, as estimated using the program CABOOM (Carlson 1978). F-15 sonic boom overpressure values are shown as a point of reference. Sonic booms generated by F-35A aircraft would be slightly more intense than sonic booms generated by F-16C aircraft during equivalent flight profiles.

The CDNL and the average number of sonic booms experienced per day at any location towards the center of the airspace units were calculated using BOOMAP for each of the beddown scenarios. Both the CDNL and the average number of sonic booms experienced per day would decrease beneath all primary training airspace units in which supersonic flight is permitted under all beddown scenarios (see Table LU 3.2–6). Because the frequency and intensity of F-35A sonic booms are expected to be similar to the frequency and intensity of F-16 sonic booms, supersonic noise levels would not increase under the beddown scenarios, although subsonic noise levels would increase. If a person feels that his or her property has been damaged by sonic booms caused by aircraft based at Luke AFB, he or she should contact the Luke AFB Public Affairs Office to initiate a claim. As stated in Section LU 3.2.1, F-35A

subsonic noise is not expected to cause damage to structures. Additional discussions on the risk of damage to structures caused by subsonic aircraft noise can be found in Cultural Resources Section LU 3.9.

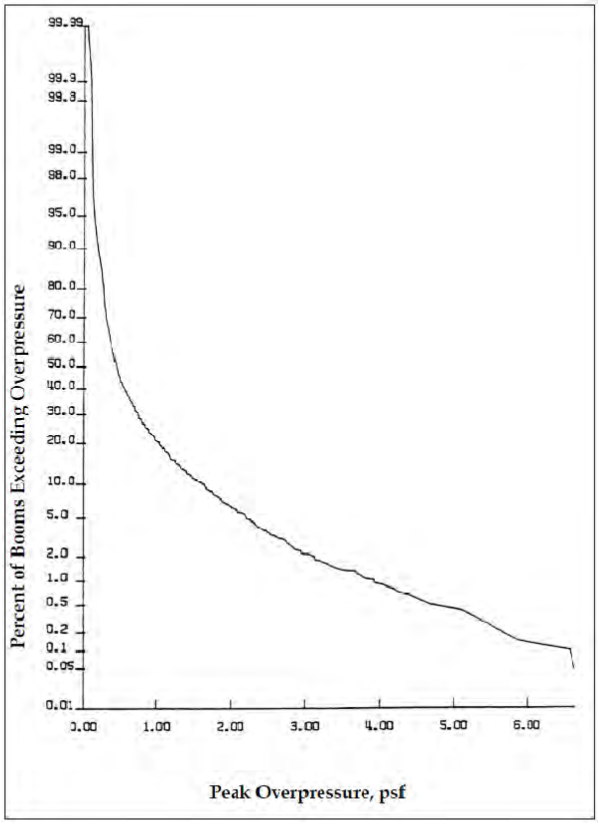
Table LU 3.2–8. Sonic Boom Peak Overpressures (pounds per square foot) for Direct Overflight of F-16 and F-35A Aircraft at Mach 1.2 Level Flight

Aircraft	*Altitude (feet above ground level)*		
	10,000	**20,000**	**30,000**
F-16C	4.9	2.5	1.6
F-15	6.4	3.3	2.2
F-35A	5.4	2.9	1.9

Note: Overpressures presented reflect straight and level flight at constant speed; aircraft maneuvers may generate localized "focus booms" with overpressures of 2 to 5 times the magnitude of the steady state sonic booms (Plotkin 1990).
Source: CABOOM (Carlson 1978).

Sonic boom overpressures associated with this type of supersonic flight decrease as the lateral distance from the aircraft flight path increases. Maneuvers can also affect boom amplitude, increasing or decreasing overpressures relative to those shown in Table LU 3.2–8. Research conducted using the ray acoustic theory computer model PCBOOM indicates that fighter aircraft sonic boom focus factors are generally in the range of 2–3 times that generated by steady state flight, while larger supersonic aircraft may generate focus booms up to 5 times more intense than booms generated by steady state flight (Plotkin 1990).

Focus booms affect very limited ground areas such that the frequency of occurrence of high-intensity focus booms is relatively low. A measurement program was conducted to record the occurrence and intensity of sonic booms near the center of a supersonic training airspace unit (Plotkin et al. 1990). Simultaneous with the sonic boom measurements, recordings were made of air combat maneuvers conducted by the F-15 aircraft that were generating the sonic booms. Figure LU 3.2–8 shows the occurrence of overpressures of various intensities recorded during air combat maneuvers, including focus booms. F-35A supersonic training is expected to be similar to F-15 and F-16 supersonic training in terms of the time spent at supersonic speeds per sortie, the types of maneuvers conducted, and the Mach numbers used during training. Therefore, the relative occurrence of the intense sonic booms would be expected to be similar to those shown in Figure LU 3.2–8**.** On average, at a given location near the center of a training airspace unit, approximately 1 percent of the sonic booms experienced would be expected to exceed 4 psf and approximately 0.2 percent would be expected to exceed 6 psf based on the results of the study. Study results do not apply to aircraft, such as the F-22, that can reach supersonic airspeeds without using afterburner.



Source: Plotkin et al. 1990.

Figure LU 3.2–8. Cumulative Distribution of Peak Overpressures

As described in Section LU 2.2.2, F-35A aircraft would conduct training with inert and live munitions at BMGR. BMGR includes several munitions impact areas approved for live munitions training. The computer program BNOISE2 was used to model noise associated with current and proposed munitions training as if all F-35A munitions training were conducted at the BMGR impact area located closest to the BMGR boundary. Furthermore, no reductions in current munitions usage were made to account for drawdown of F-16 aircraft scheduled to occur concurrently with the F-35A beddown. Using these extremely conservative noise modeling assumptions, modeled noise levels exceeding 62 dB CDNL would not extend beyond the boundaries of DoD-owned land under any beddown scenarios. F-35A munitions training noise may be audible at off-range locations, but would occur relatively infrequently.

Auxiliary Airfields

Gila Bend AFAF. Under all Luke AFB beddown scenarios, Gila Bend AFAF would be used for practice approaches by F-35A aircraft. Noise contours under baseline conditions are shown in Figure LU 3.2–9. As a point of reference, Figure LU 3.2–9 shows the 2005 Gila Bend AFAF JLUS 65 dB DNL noise contours. Section LU 3.2.1.1 explains the JLUS contour. Noise contours at Gila Bend AFAF under Scenarios L1, L2, L3, L4, L5, and L6 are shown in Figures LU 3.2–10, LU 3.2–11, LU 3.2–12, LU 3.2–13, LU 3.2–14, and LU 3.2–15, respectively. The off-installation area affected by noise levels greater than 65 dB DNL would increase by approximately 246, 1,184, 1,981, 2,682, 3,310, and 3,864 acres under Scenarios L1, L2, L3, L4, L5, and L6, respectively, relative to baseline conditions (see Table LU 3.2–9).

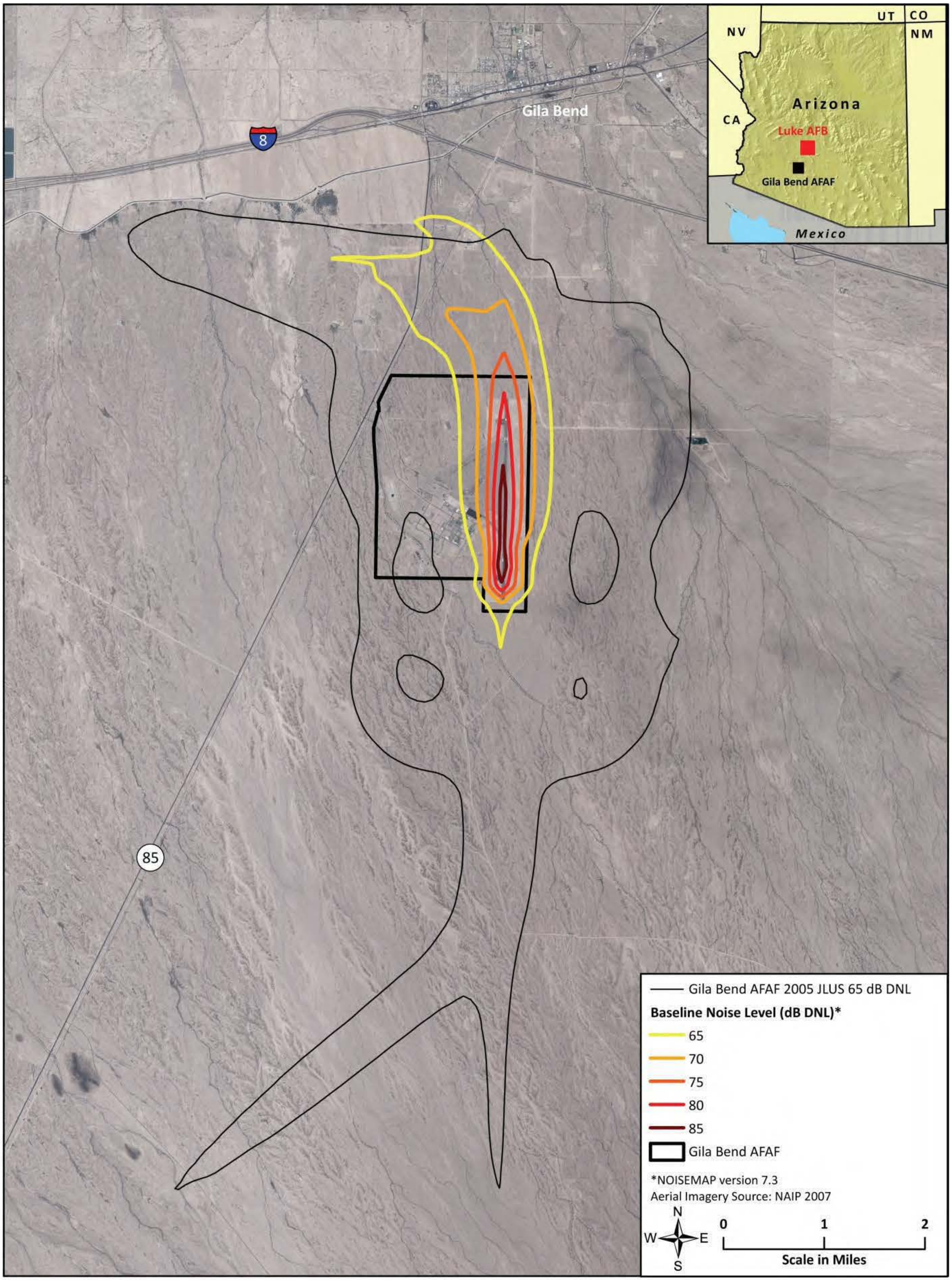


Figure LU 3.2–9. Noise Contours from Gila Bend AFAF Joint Land Use Study Overlaid on Baseline Noise Contours

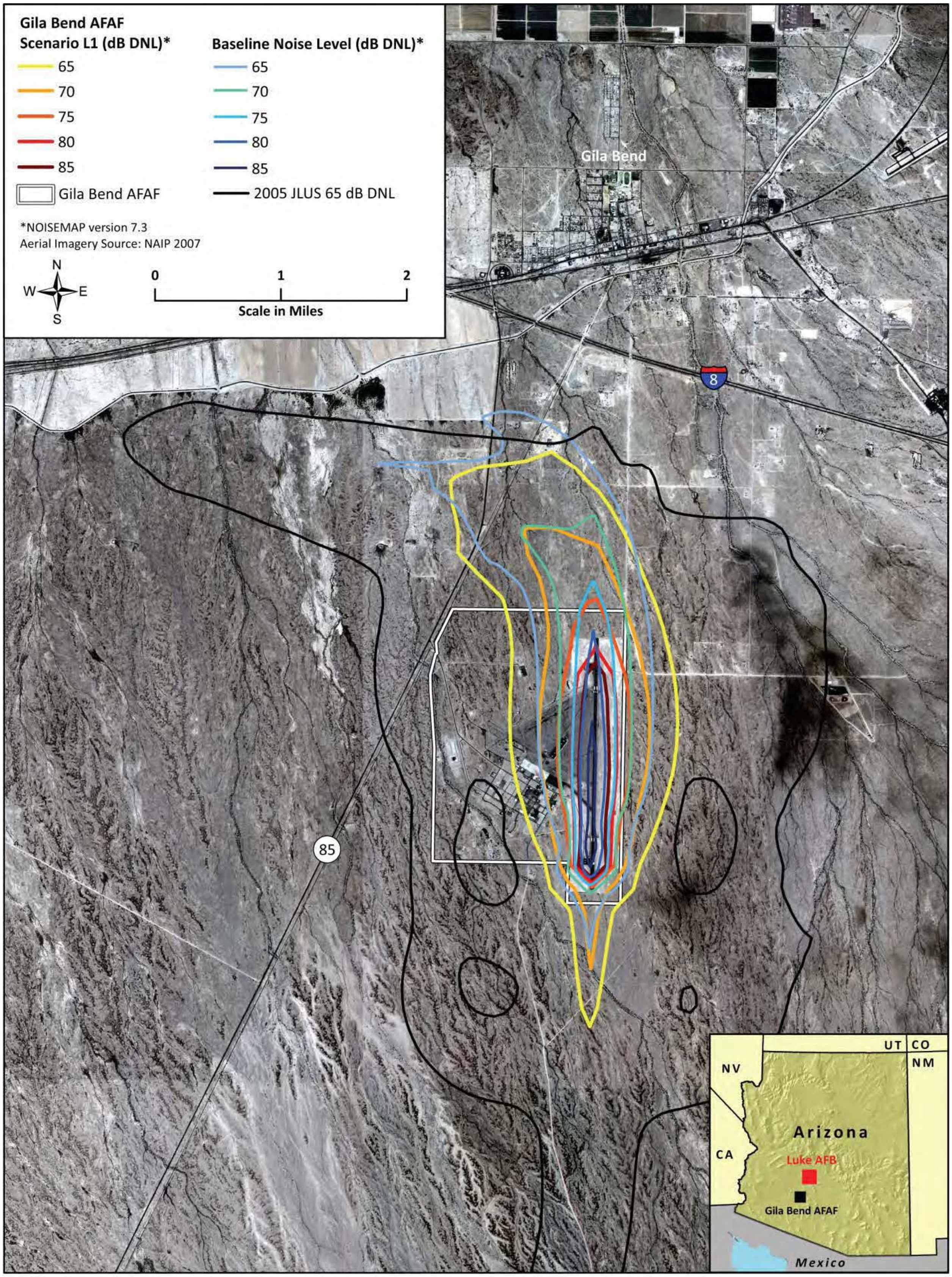


Figure LU 3.2–10. Scenario L1 and Baseline Noise Contours at Gila Bend AFAF

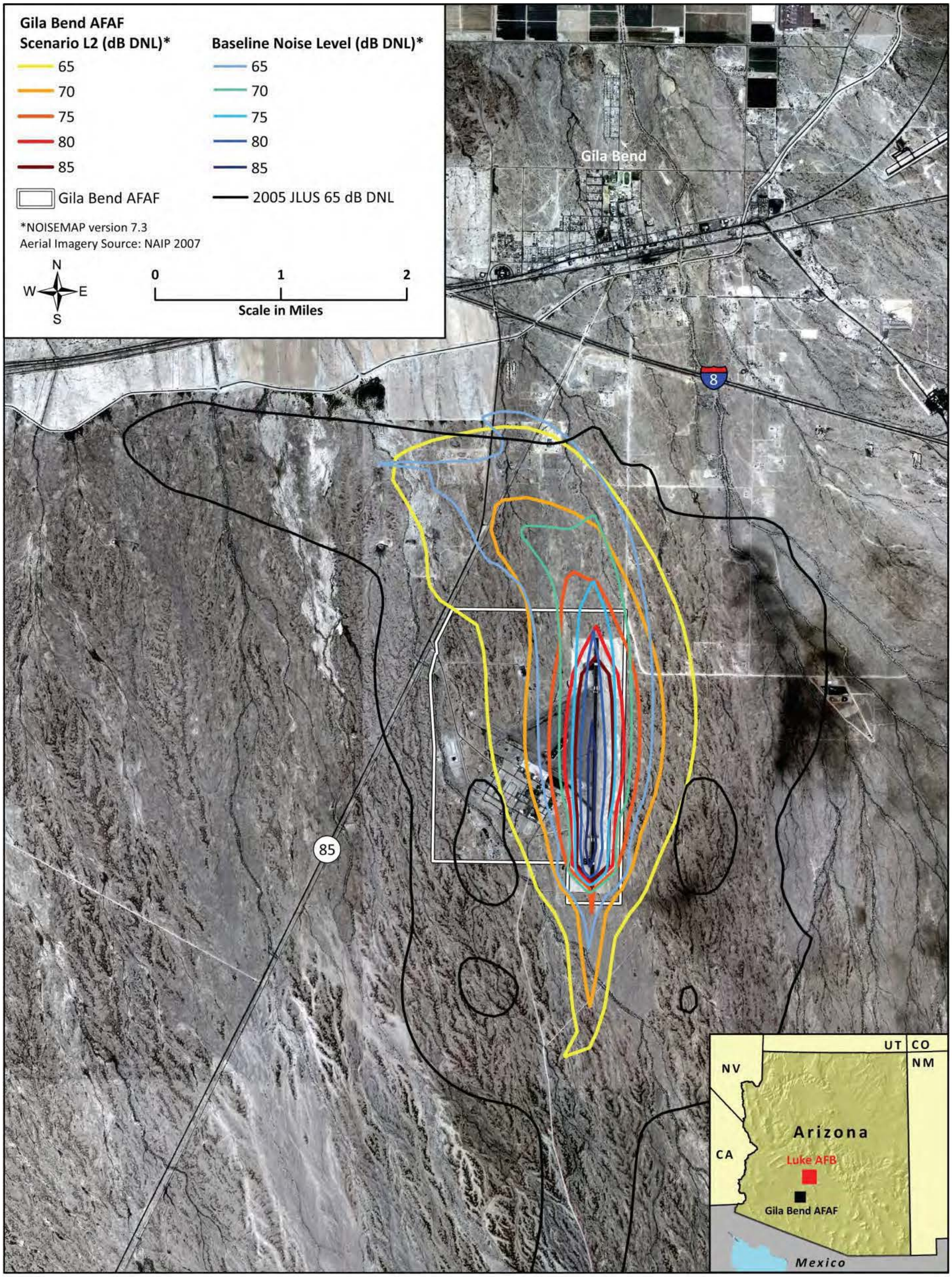


Figure LU 3.2–11. Scenario L2 and Baseline Noise Contours at Gila Bend AFAF

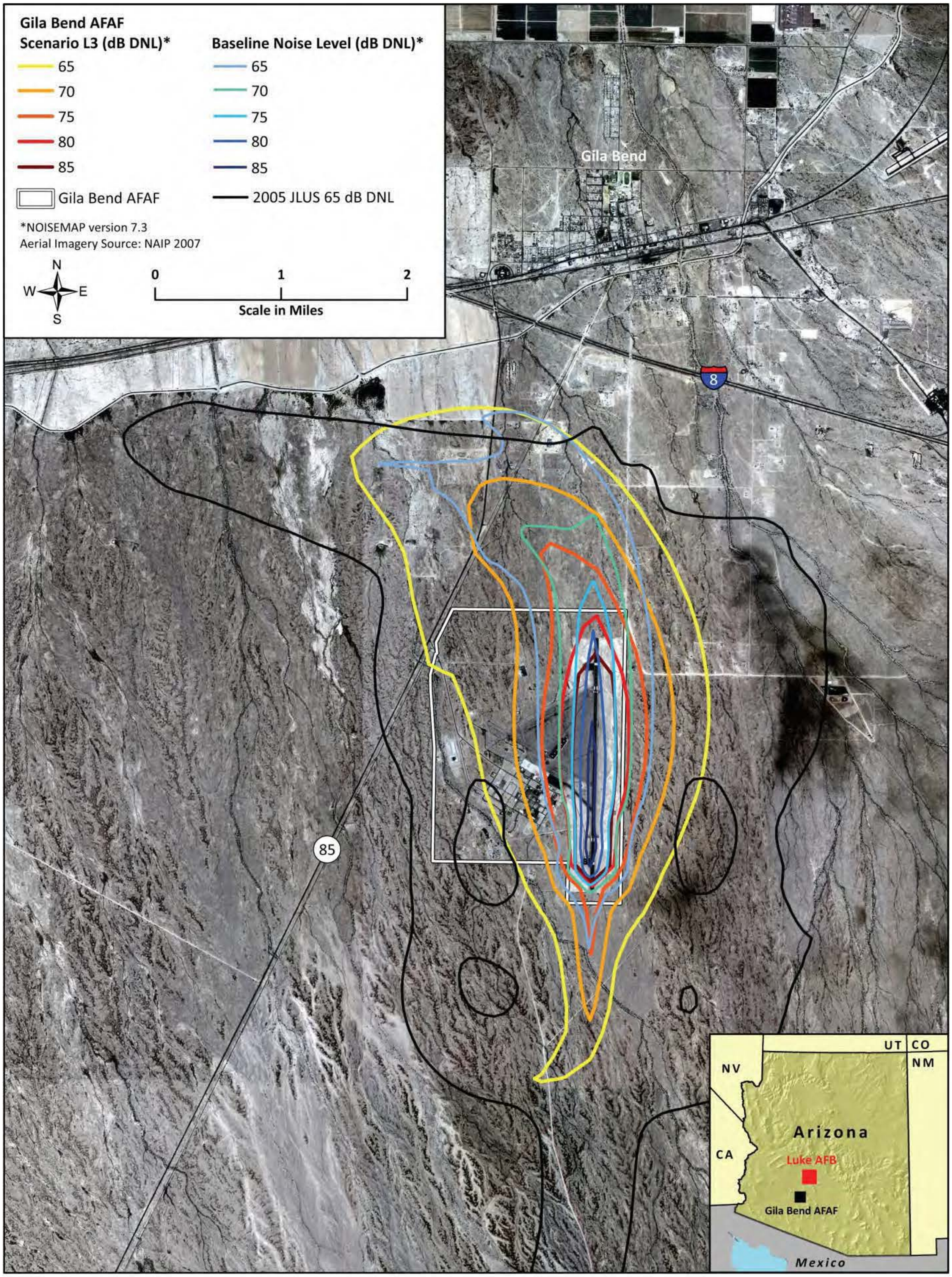


Figure LU 3.2–12. Scenario L3 and Baseline Noise Contours at Gila Bend AFAF

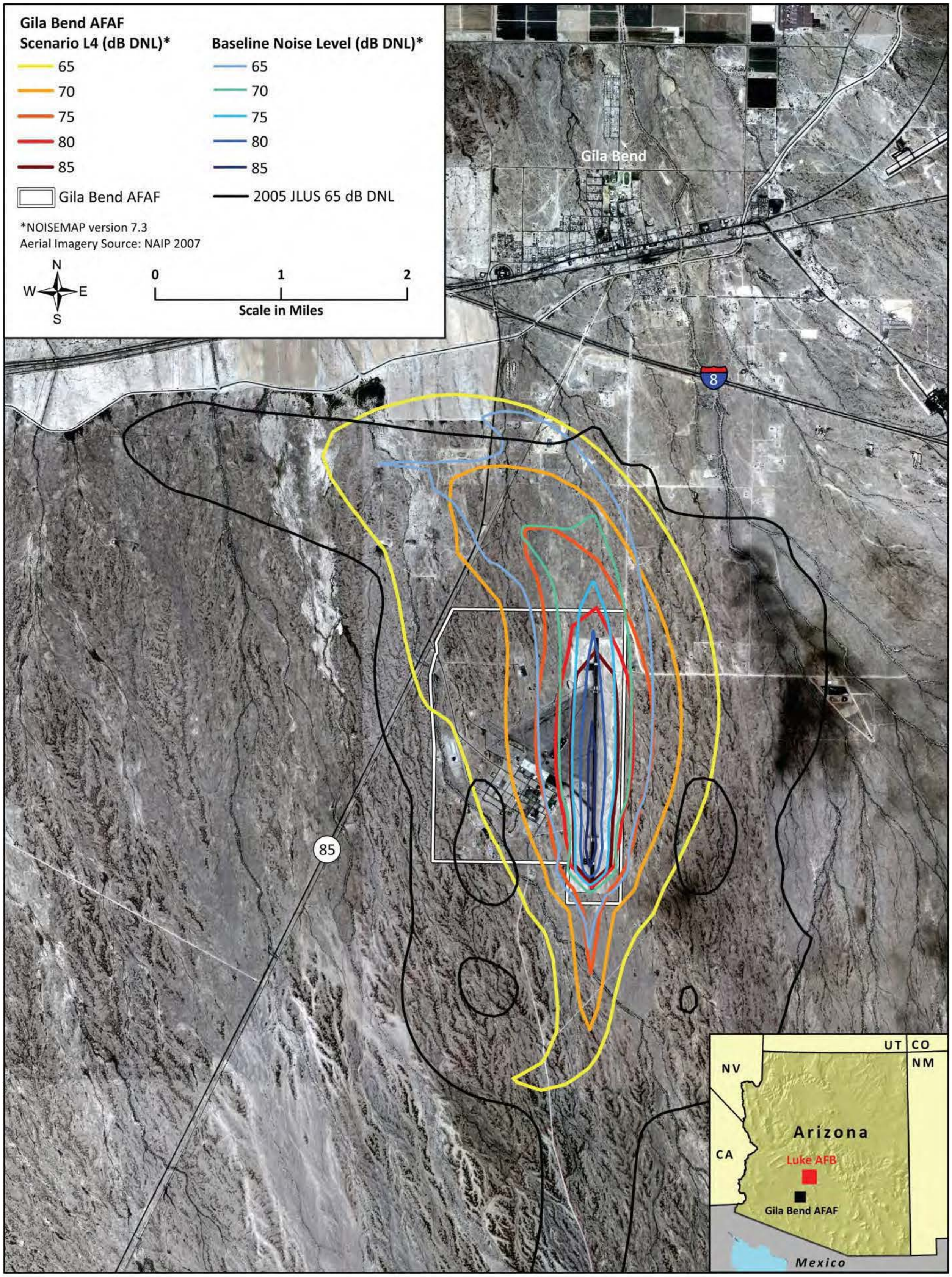


Figure LU 3.2–13. Scenario L4 and Baseline Noise Contours at Gila Bend AFAF

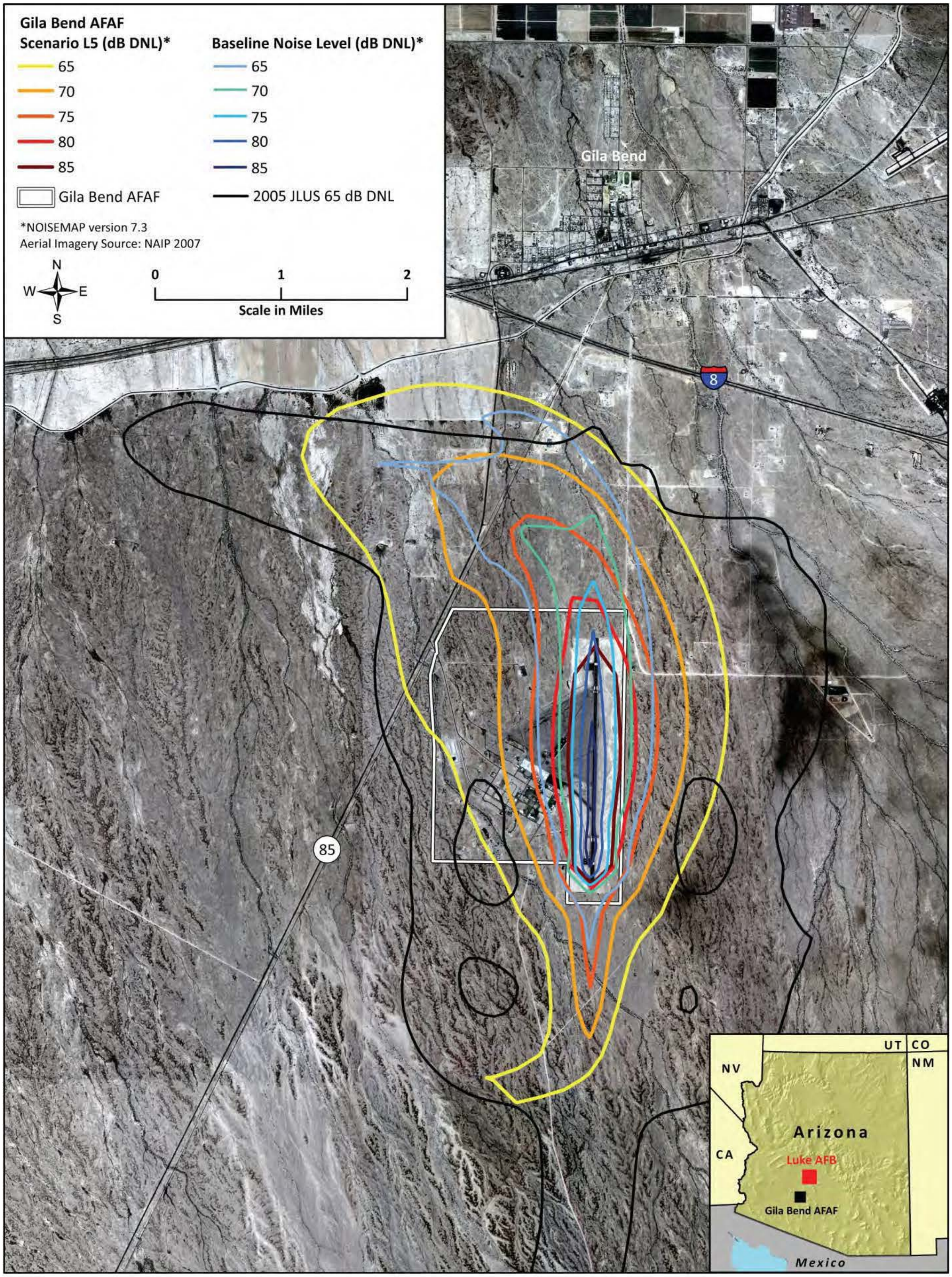


Figure LU 3.2–14. Scenario L5 and Baseline Noise Contours at Gila Bend AFAF

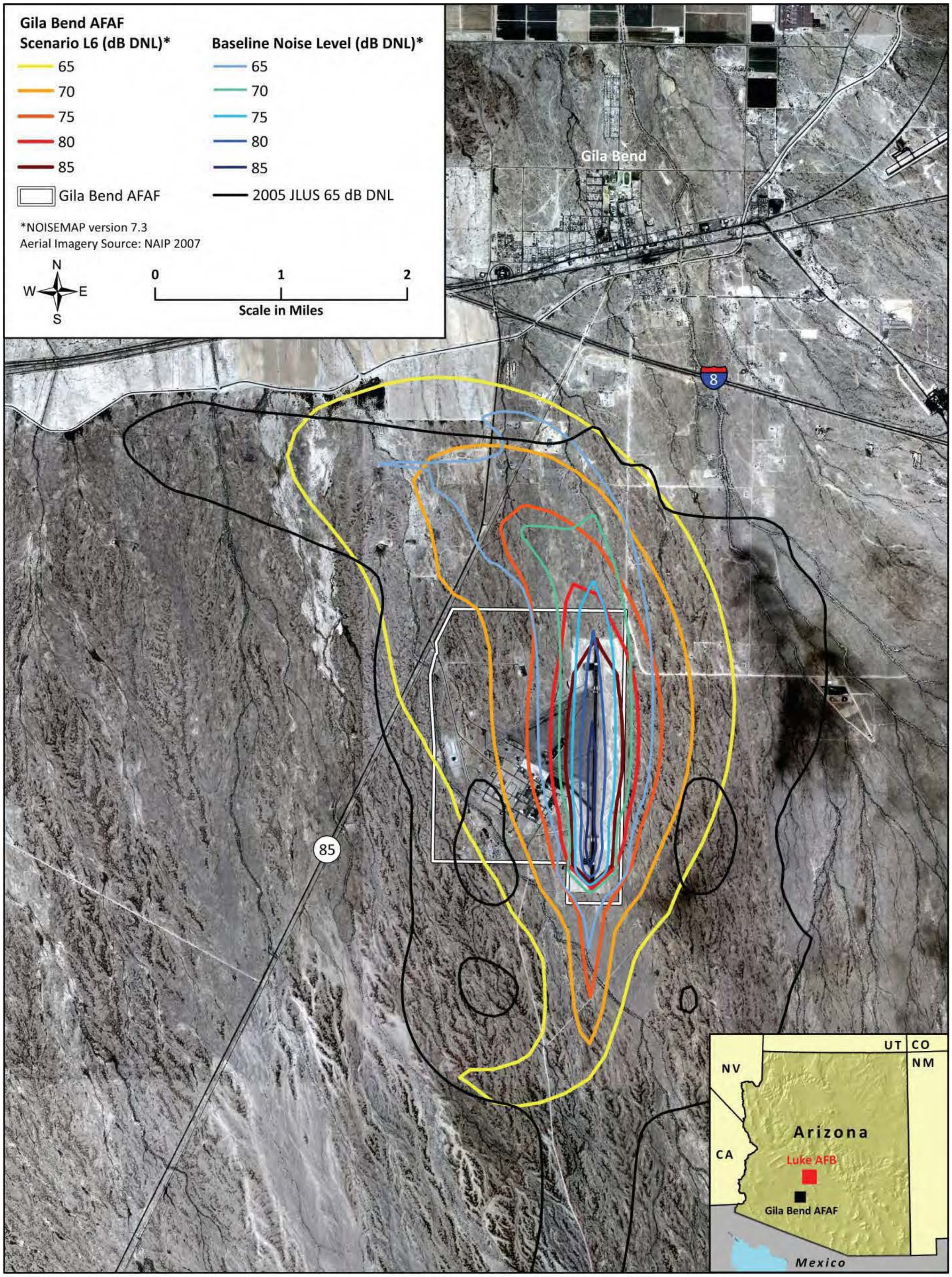


Figure LU 3.2–15. Scenario L6 and Baseline Noise Contours at Gila Bend AFAF

Table LU 3.2–9. Population and Acreage Under Noise Contours Near Gila Bend AFAF, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation)*		*Total Area Affected (Off-Installation)*		*Total Area Affected (On-Installation)*	
	Number	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions						
Total ≥ 65	**3**	**N/A**	**1,313**	**N/A**	**907**	**N/A**
65–69	3	N/A	1,018	N/A	250	N/A
70–74	0	N/A	279	N/A	250	N/A
75–79	0	N/A	16	N/A	225	N/A
80–84	0	N/A	0	N/A	146	N/A
≥ 85	0	N/A	0	N/A	36	N/A
Scenario L1 (24 Aircraft)						
Total ≥ 65	**1**	**(2)**	**1,559**	**246**	**1,174**	**267**
65–69	1	(2)	1,121	103	314	64
70–74	0	0	403	124	272	22
75–79	0	0	35	19	242	17
80–84	0	0	0	0	131	(15)
≥ 85	0	0	0	0	215	179
Scenario L2 (48 Aircraft)						
Total ≥ 65	**5**	**2**	**2,497**	**1,184**	**1,411**	**504**
65–69	5	2	1,634	616	391	141
70–74	0	0	715	436	297	47
75–79	0	0	147	131	268	43
80–84	0	0	1	1	170	24
≥ 85	0	0	0	0	285	249
Scenario L3 (72 Aircraft)						
Total ≥ 65	**9**	**6**	**3,294**	**1,981**	**1,638**	**731**
65–69	8	5	2,069	1,051	510	260
70–74	1	1	928	649	309	59
75–79	0	0	277	261	281	56
80–84	0	0	20	20	210	64
≥ 85	0	0	0	0	328	292
Scenario L4 (96 Aircraft)						
Total ≥ 65	**11**	**8**	**3,995**	**2,682**	**1,770**	**863**
65–69	10	7	2,445	1,427	556	306
70–74	1	1	1,098	819	322	72
75–79	0	0	410	394	288	63
80–84	0	0	42	42	244	98
≥ 85	0	0	0	0	360	324
Scenario L5 (120 Aircraft)						
Total ≥ 65	**13**	**10**	**4,623**	**3,310**	**1,850**	**943**
65–69	11	8	2,771	1,753	564	314
70–74	2	2	1,261	982	338	88
75–79	0	0	516	500	293	68
80–84	0	0	75	75	263	117
≥ 85	0	0	0	0	392	356

Contour Interval (dB DNL)	**_Population Affected (Off-Installation)_**		**_Total Area Affected (Off-Installation)_**		**_Total Area Affected (On-Installation)_**	
	Number	**Change**	**Acres**	**Change**	**Acres**	**Change**
Scenario L6 (144 Aircraft)						
Total ≥ 65	**15**	**12**	**5,177**	**3,864**	**1,909**	**1,002**
65–69	12	9	3,040	2,022	550	300
70–74	3	3	1,415	1,136	366	116
75–79	0	0	612	596	300	75
80–84	0	0	110	110	266	120
≥ 85	0	0	0	0	427	391

Note: (Number) denotes a negative number.

The number of on-installation acres affected by noise levels greater than 65 dB DNL would increase by 267, 504, 731, 863, 943, and 1,002 under Scenarios L1, L2, L3, L4, L5, and L6, respectively. The estimated number of off-installation residents affected under Scenario L1 would decrease by 2 due to areas affected at greater than 65 dB DNL shifting to less densely populated areas. Under Scenarios L2, L3, L4, L5, and L6, the estimated population affected would increase by 2, 6, 8, 10, and 12, respectively. No persons reside on the installation. Persons exposed to increased noise levels, particularly those exceeding 65 dB DNL, may experience increased annoyance. No persons reside within the 80 dB DNL noise contour at Gila Bend AFAF under any scenario, and hearing loss risk would be minimal.

Aux-1. Aux-1 would also be used for F-35A practice approaches under the Luke AFB beddown scenarios. Noise contours under baseline conditions are shown in Figure LU 3.2–16. As a point of reference, Figure LU 3.2–16 shows the 2004 Aux-1 JLUS 65 dB DNL noise contours. Section LU 3.2.1.1 explains the JLUS contour. Noise contours under Scenarios L1, L2, L3, L4, L5, and L6 are shown in Figures LU 3.2–17, LU 3.2–18, LU 3.2–19, LU 3.2–20, LU 3.2–21, and LU 3.2–22, respectively, overlaid on baseline noise contours. The off-installation area affected by noise levels greater than 65 dB DNL would decrease by approximately 5,398, 4,492, 3,583, 2,781, 2,022, and 1,335 acres, respectively, under Scenarios L1, L2, L3, L4, L5, and L6, relative to baseline conditions (see Table LU 3.2–10). The number of on-installation acres affected by noise levels greater than 65 dB DNL would decrease under Scenarios L1 and L2, remain the same under Scenarios L3 and L4, and increase by 1 acre under Scenarios L5 and L6. The number of off-installation residents affected by noise levels greater than 65 dB DNL would decrease under Scenarios L1, L2, L3, L4, and L5 by 585, 460, 383, 222, and 63, respectively, but would increase by 92 under Scenario L6. Persons exposed to increased noise levels, particularly those exceeding 65 dB DNL, may experience increased annoyance and activity interference.

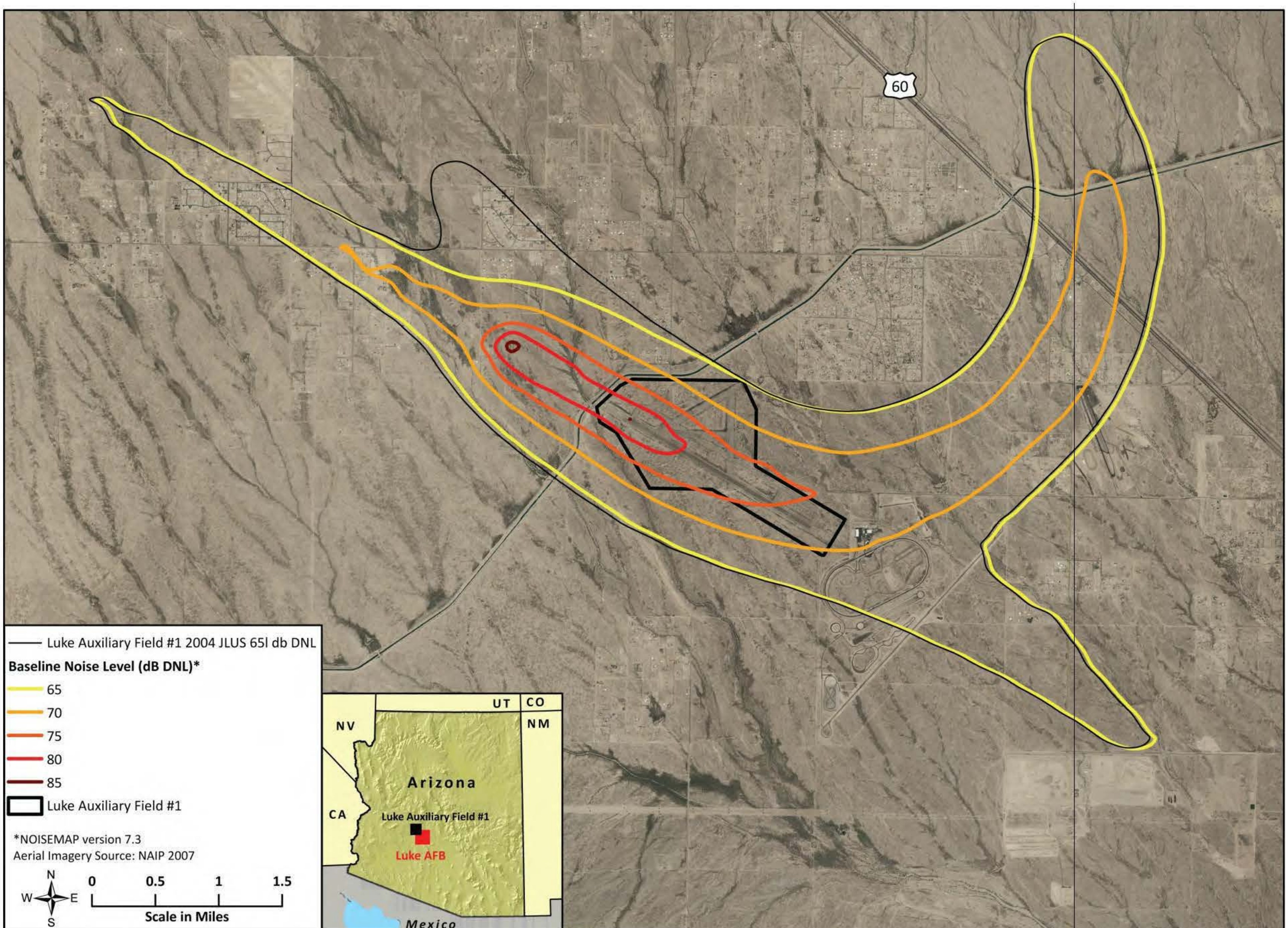


Figure LU 3.2–16. Noise Contours from Aux-1 JLUS Overlaid on Baseline Noise Contours

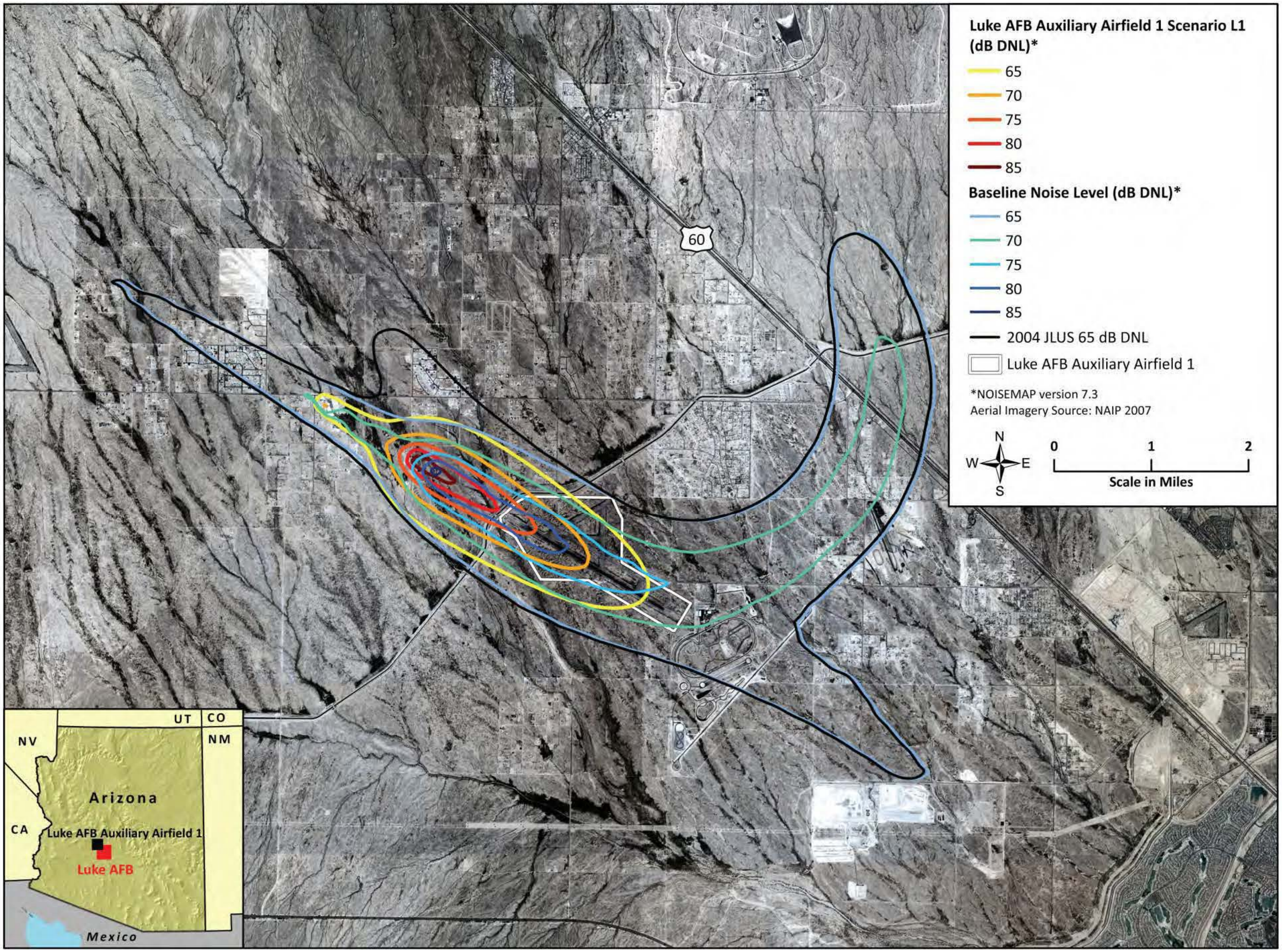


Figure LU 3.2–17. Scenario L1 and Baseline Noise Contours at Aux-1

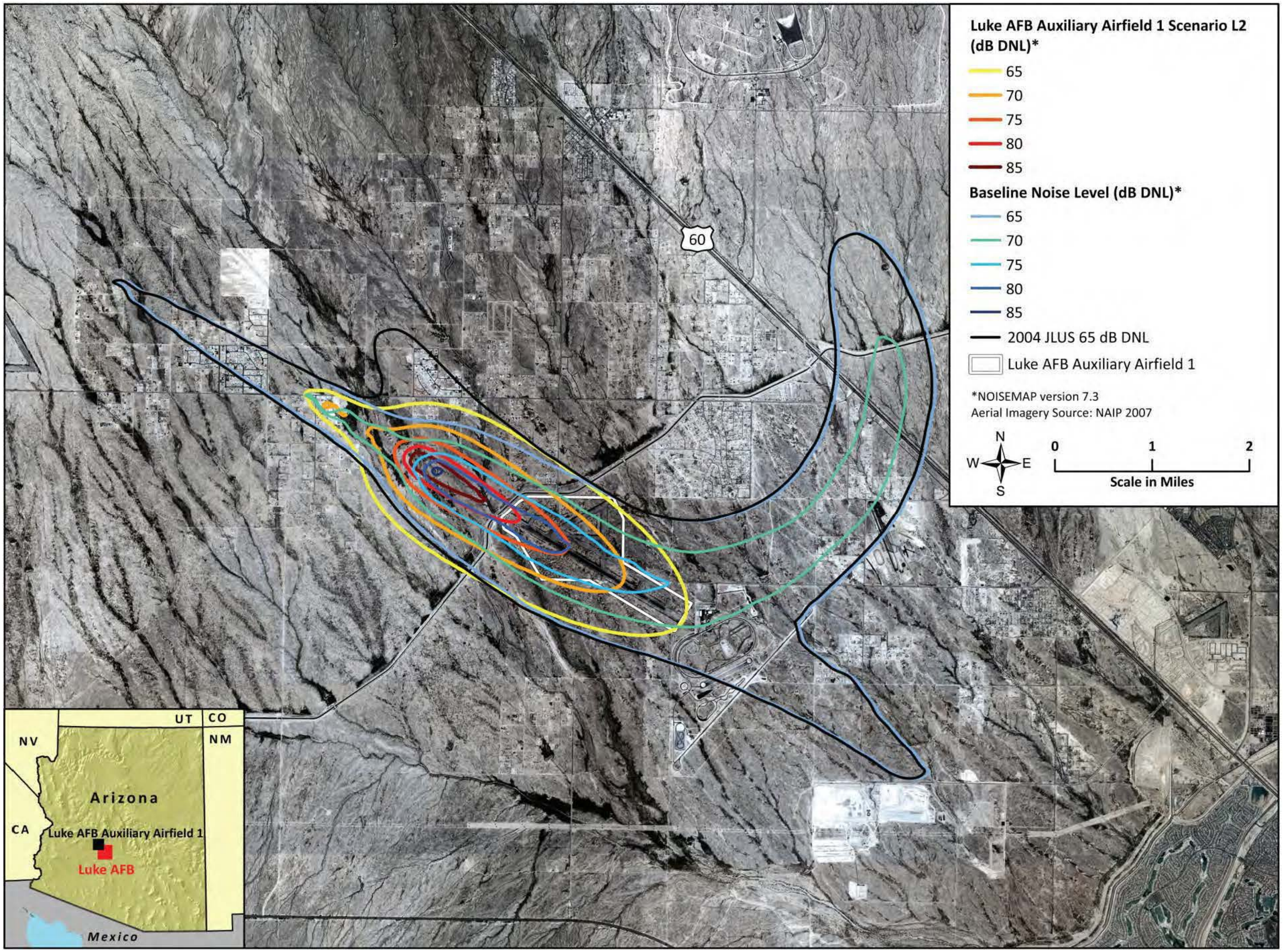


Figure LU 3.2–18. Scenario L2 and Baseline Noise Contours at Aux-1

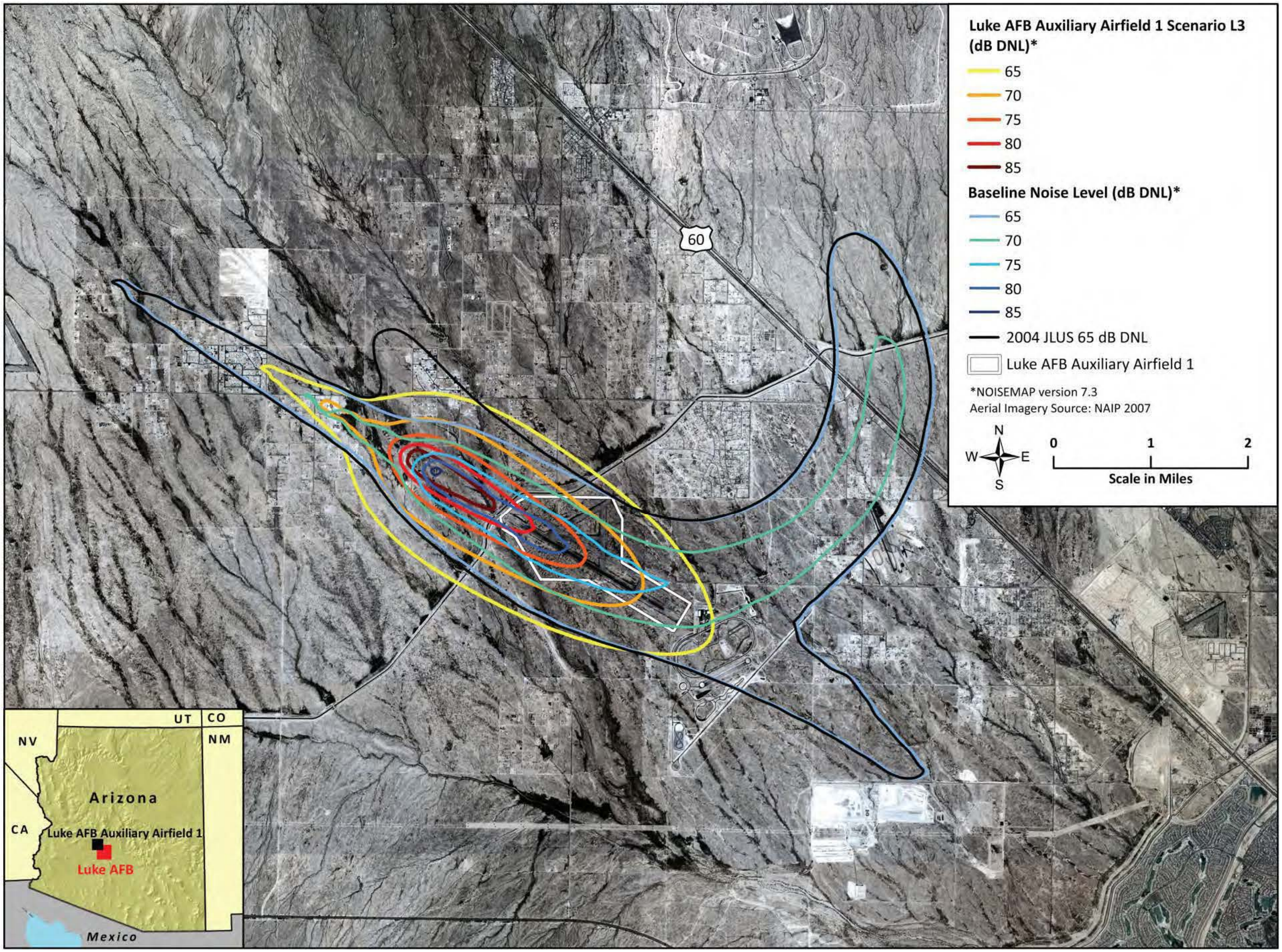


Figure LU 3.2–19. Scenario L3 and Baseline Noise Contours at Aux-1

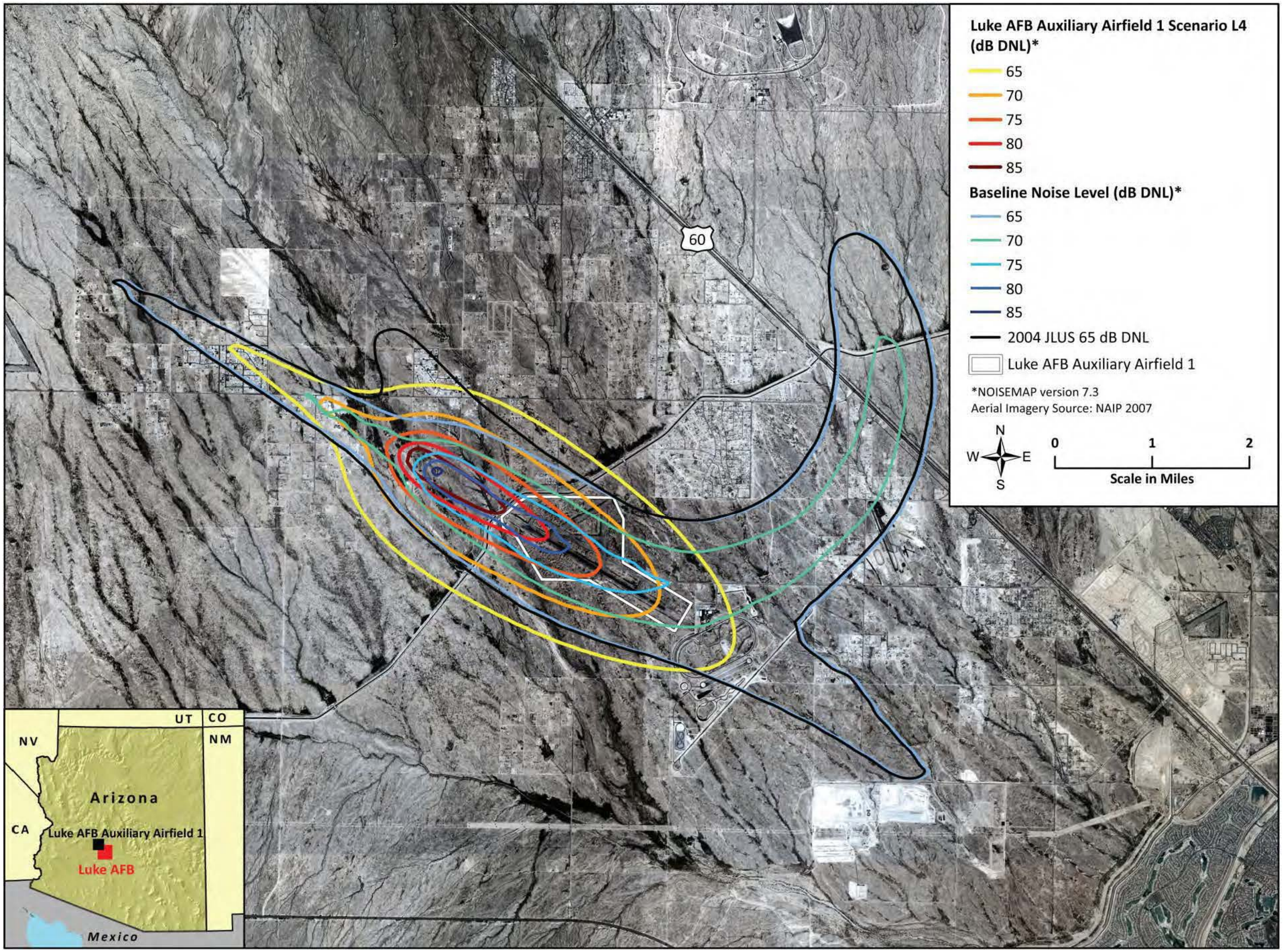


Figure LU 3.2–20. Scenario L4 and Baseline Noise Contours at Aux-1

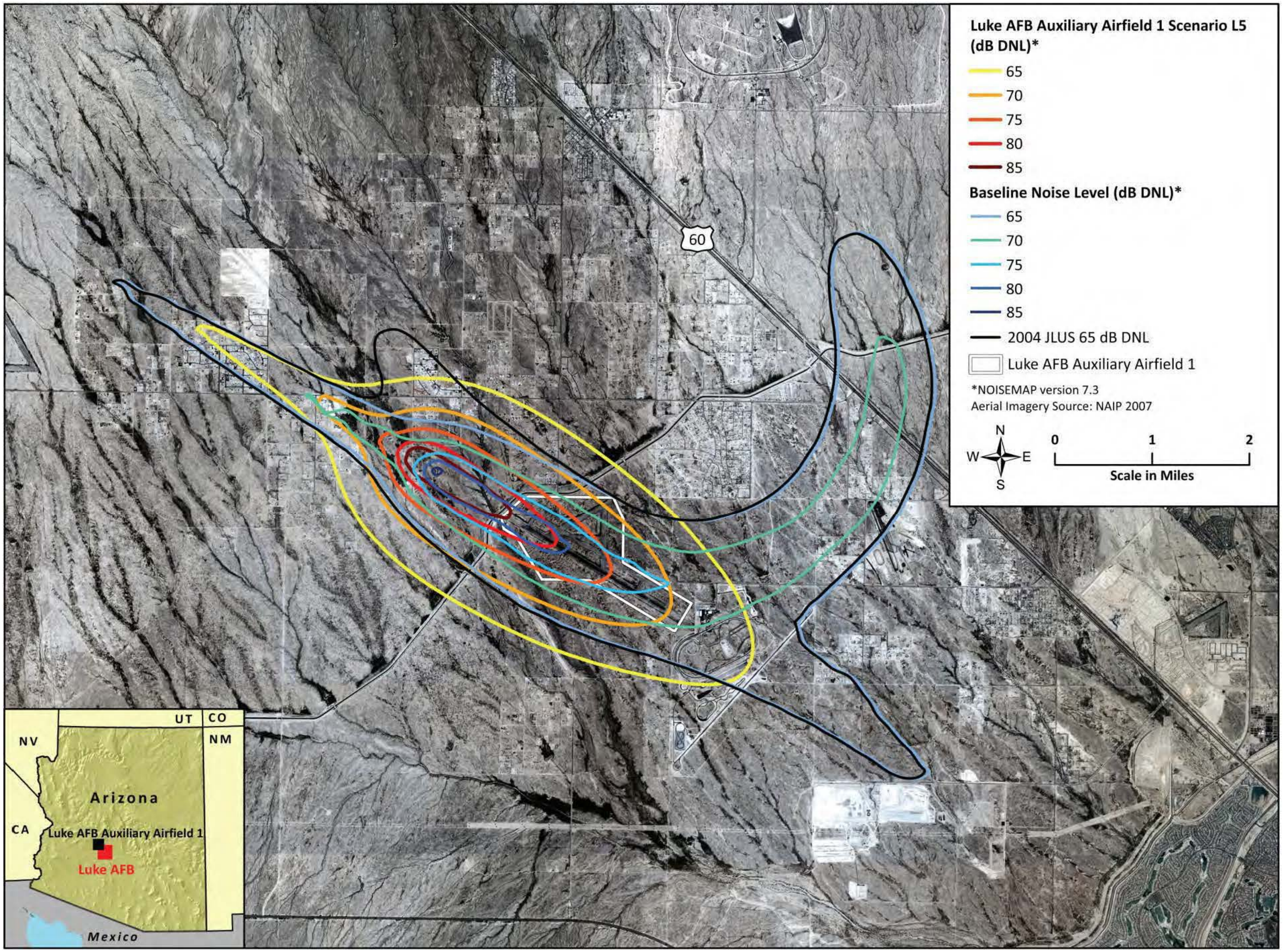


Figure LU 3.2–21. Scenario L5 and Baseline Noise Contours at Aux-1

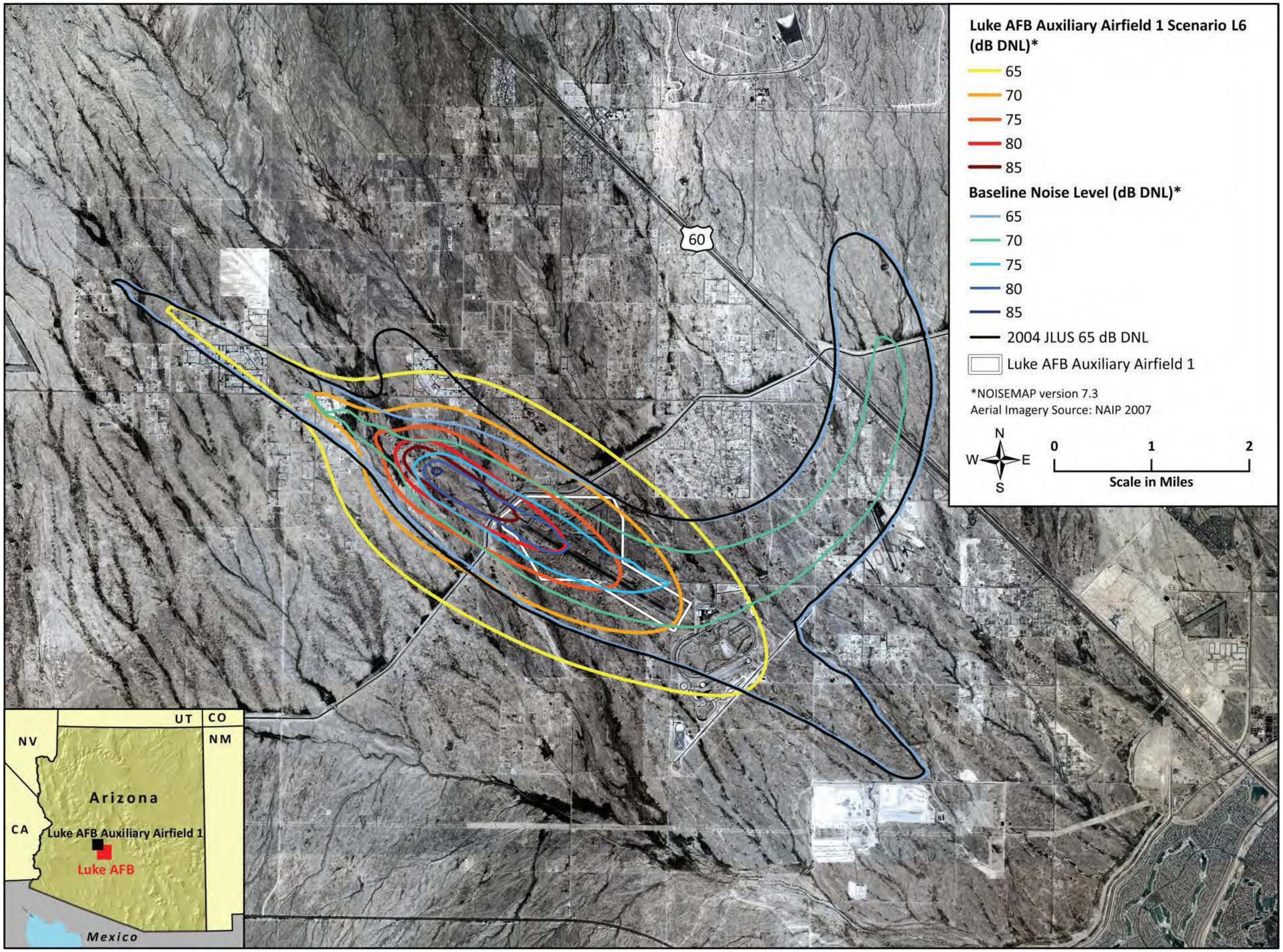


Figure LU 3.2–22. Scenario L6 and Baseline Noise Contours at Aux-1

Table LU 3.2–10. Population and Acreage Under Noise Contours Near Aux-1, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation/Airport)*		*Total Area Affected (Off-Installation/Airport)*		*Total Area Affected (On-Installation/Airport)*	
	Number	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions						
Total ≥ 65	**710**	**N/A**	**6,786**	**N/A**	**756**	**N/A**
65–69	588	N/A	4,513	N/A	71	N/A
70–74	111	N/A	1,920	N/A	265	N/A
75–79	7	N/A	204	N/A	318	N/A
80–84	4	N/A	146	N/A	102	N/A
≥ 85	0	N/A	3	N/A	0	N/A
Scenario L1 (24 Aircraft)						
Total ≥ 65	**125**	**(585)**	**1,388**	**(5,398)**	**596**	**(160)**
65–69	90	(498)	813	(3,700)	346	275
70–74	17	(94)	283	(1,637)	205	(60)
75–79	8	1	161	(43)	45	(273)
80–84	6	2	102	(44)	0	(102)
≥ 85	4	4	29	26	0	0
Scenario L2 (48 Aircraft)						
Total ≥ 65	**250**	**(460)**	**2,294**	**(4,492)**	**751**	**(5)**
65–69	189	(399)	1,384	(3,129)	286	215
70–74	34	(77)	475	(1,445)	323	58
75–79	12	5	213	9	131	(187)
80–84	7	3	141	(5)	11	(91)
≥ 85	8	8	81	78	0	0
Scenario L3 (72 Aircraft)						
Total ≥ 65	**327**	**(383)**	**3,203**	**(3,583)**	**756**	**0**
65–69	223	(365)	1,934	(2,579)	180	109
70–74	70	(41)	719	(1,201)	344	79
75–79	16	9	268	64	193	(125)
80–84	8	4	158	12	39	(63)
≥ 85	10	10	124	121	0	0
Scenario L4 (96 Aircraft)						
Total ≥ 65	**488**	**(222)**	**4,005**	**(2,781)**	**756**	**0**
65–69	336	(252)	2,422	(2,091)	108	37
70–74	110	(1)	932	(988)	333	68
75–79	21	14	320	116	243	(75)
80–84	9	5	172	26	72	(30)
≥ 85	12	12	159	156	0	0

Contour Interval (dB DNL)	*Population Affected (Off-Installation/Airport)*		*Total Area Affected (Off-Installation/Airport)*		*Total Area Affected (On-Installation/Airport)*	
	Number	**Change**	**Acres**	**Change**	**Acres**	**Change**
Scenario L5 (120 Aircraft)						
Total ≥ 65	**647**	**(63)**	**4,764**	**(2,022)**	**757**	**1**
65–69	455	(133)	2,884	(1,629)	57	(14)
70–74	144	33	1,126	(794)	313	48
75–79	25	18	378	174	286	(32)
80–84	10	6	186	40	99	(3)
≥ 85	13	13	190	187	2	2
Scenario L6 (144 Aircraft)						
Total ≥ 65	**802**	**92**	**5,451**	**(1,335)**	**757**	**1**
65–69	574	(14)	3,293	(1,220)	18	(53)
70–74	173	62	1,300	(620)	293	28
75–79	30	23	439	235	314	(4)
80–84	11	7	205	59	123	21
≥ 85	14	14	214	211	9	9

Note: (Number) denotes a negative number.

Under Scenarios L1, L2, L3, L4, L5, and L6, the estimated number of off-installation residents affected by noise levels greater than 80 dB DNL would increase from 5 to 8, 14, 17, 19, 22, and 25 persons, respectively (see Table LU 3.2–11). Persons exposed to noise at greater than 80 dB DNL would have an increased likelihood of experiencing NIPTS, as shown in Chapter 3, Table 3–2. For example, if the estimated 1 individual exposed to noise levels between 82 and 83 dB under Scenario L1 were to have an average response to noise, then he or she may experience as much as a 4 dB NIPTS in hearing if he or she were to remain in that location every day for 8 hours per day for 40 years and be fully exposed to the noise level at his or her residence (i.e., no time is spent indoors). If the same individual were to spend the national average percentage of his or her total day indoors (87 percent), then the individual would be expected to experience no more than 1 dB NIPTS in hearing. If the individual were particularly sensitive, he or she could experience up to a 9 dB NIPTS if he or she were fully exposed to noise and up to 3.5 dB NIPTS if he or she spends the national average percentage of his or her day indoors.

Table LU 3.2–11. Aux-1 Off-Installation Population Exposed to Noise Levels that Could Result in NIPTS, Baseline Conditions and F-35A Beddown Scenarios

Contour Band (dB DNL)	*Estimated Population*						
	Baseline Conditions	**Scenario L1 (24 Aircraft)**	**Scenario L2 (48 Aircraft)**	**Scenario L3 (72 Aircraft)**	**Scenario L4 (96 Aircraft)**	**Scenario L5 (120 Aircraft)**	**Scenario L6 (144 Aircraft)**
80–81	1	1	2	2	2	3	3
81–82	1	1	2	2	2	2	3
82–83	1	1	1	2	2	2	2
83–84	1	1	1	1	2	2	2
84–85	1	1	1	1	1	2	2
85–86	0	1	1	1	1	1	2
86–87	0	1	1	1	1	1	1
87–88	0	1	1	1	1	1	1
88–89	0	0	1	1	1	1	1
89–90	0	0	1	1	1	1	1
90–91	0	0	2	4	5	6	7
Total	**5**	**8**	**14**	**17**	**19**	**22**	**25**

Note that, in areas where population is sparse, such as the area in the vicinity of Aux-1, the population is unevenly distributed, making estimates of population in a certain area (i.e., within a noise contour interval) particularly prone to error. Population estimates in Table LU 3.2–11 are based on 2010 census demographics data, calculated by proportioning census block populations by the area encompassed within each noise interval. This method counts permanent residents only, and does not estimate persons residing in hotels and other accommodations. PHL risk among DoD employees on Aux-1 would be evaluated using the appropriate DoD component regulations for occupational noise exposure.

LU 3.3 Air Quality

LU 3.3.1 Base

LU 3.3.1.1 Base Affected Environment

Air quality at a given location can be described by the concentrations of various air pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing its concentration to an appropriate Federal and/or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The U.S. Environmental Protection Agency (EPA) established the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 in diameter ($PM_{2.5}$), and lead. Units of concentration for these standards are generally expressed in parts per million or micrograms per cubic meter. The Arizona Department of Environmental Quality (ADEQ) has adopted standards that are the same as the NAAQS. Table 3–3 in Chapter 3, Section 3.3, presents the NAAQS.

Region of Influence

Air emissions produced from construction and operation of the beddown of F-35A aircraft at Luke AFB would mainly affect air quality within Maricopa County. Potential aircraft operations would also affect air quality within training areas associated with Luke AFB and aircraft flight routes between these locations. Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as CO and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as O_3 may extend much farther downwind than for inert pollutants. O_3 is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. O_3 precursors are mainly nitrogen oxides (NO_X) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O_3 levels usually occurs several hours after they are emitted and many miles from their source.

Existing Air Quality

The EPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area generally is in nonattainment for a pollutant if the applicable NAAQS has been exceeded more than once per year. Former nonattainment areas that have attained the NAAQS are designated as maintenance areas. Currently, the portion of Maricopa County that includes Luke AFB is in serious nonattainment of the PM_{10} standard and basic nonattainment of the 8-hour O_3 standard, and it is a maintenance area for CO.

In the past, Maricopa County did not attain the NAAQS for CO. Due to a reduction in emissions caused by Federal emission standards for new vehicles and a state vehicle emissions testing program, the Phoenix area has not exceeded the CO NAAQS since 1996. As a result, the EPA redesignated the region as in attainment for the CO standards on April 8, 2005.

Regional Air Emissions. Luke AFB is located in Maricopa County; Table LU 3.3–1 summarizes the 2008 annual emissions estimated for this region (EPA 2011). The majority of emissions within the region occur from (1) on-road and nonroad mobile sources (VOCs, CO, and NO_X), (2) solvent/surface coating usages (VOCs), and (3) fugitive dust (PM_{10}/$PM_{2.5}$).

Table LU 3.3–1. Annual Emissions for Maricopa County, Arizona, Calendar Year 2008

Source Type	*Air Pollutant Emissions (tons per year)*					
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Stationary Sources	52,227	17,528	12,774	1,134	62,087	13,900
Mobile Sources	38,387	417,219	76,245	610	3,598	2,805
Total	**90,613**	**434,819**	**89,019**	**1,744**	**65,685**	**16,705**

Source: EPA 2011.

Luke AFB Emissions. Table LU 3.3–2 presents an estimation of annual emissions that occurred due to operations of 211 F-16 aircraft at Luke AFB in the base case year of 1999. This scenario is chosen for the base case conditions because it coincides with the base case conditions used for the most recent federally approved O_3 State Implementation Plan (SIP) for Maricopa County

(see discussion below under Local Regulations). Existing sources that would be affected by the beddown of F-35A at Luke AFB include (1) operations of general aviation and air carrier aircraft, (2) operations and engine maintenance/testing of F-16 aircraft, (3) onsite personally and government-owned vehicles (POVs and GOVs), (4) offsite POV commutes, (5) aerospace ground equipment (AGE), (6) nonroad mobile equipment, and (7) stationary and other sources. Emissions associated with existing F-16 aircraft operations at Luke AFB were obtained from (1) the *1999 Periodic Ozone Emissions Inventory for the Maricopa County, Arizona, Nonattainment Area* (Maricopa County AQD 2002) and (2) an analysis of Luke AFB base case emissions (56th Fighter Wing, Luke AFB 2010). Assumptions used in the Luke AFB base case analysis were based on pilot and staff operational experience, as documented in the *Aircraft Operations Resource Book* (56th Fighter Wing, Luke AFB 2007a). These data include definitions of the mean mixing height in the region (2,868 feet AGL, as approved by the Maricopa County Air Quality Department [Maricopa County AQD]) and locations of aircraft flight patterns in relation to the boundaries of the applicable nonattainment areas. Emissions from existing non-aircraft source categories that support the F-16 mission were obtained from the *2003 Luke Air Force Base Mobile Source Emissions Inventory* (MACTEC Engineering and Consulting, Inc. 2004).

Table LU 3.3–2. Annual Emissions at Luke AFB, Year 1999 Base Case

	Air Pollutant Emissions (tons per year)						
Activity	**VOCs**	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
General Aviation	2.90	105.80	0.40	0.01	1.09	1.09	6,835
Air Carrier/Taxi	7.10	22.60	40.10	0.00	0.70	0.70	4,373
Military Aircraft	331.06	799.40	397.10	52.74	28.33	28.33	177,496
GOVs	3.95	24.95	8.70	0.36	0.55	0.51	12,982
POVs	87.00	675.00	60.10	3.65	1.79	1.64	182,250
AGE	1.94	5.19	34.50	1.58	1.84	1.69	1,319
Nonroad	33.20	235.00	79.50	11.30	9.70	8.92	403,571
Point and Area Sources	32.47	14.12	14.62	3.70	3.21	2.95	183
Total Emissions	**499.63**	**1,882.06**	**635.02**	**73.34**	**47.21**	**45.84**	**789,009**

Key: CO_{2e}=carbon dioxide equivalent.

Regional Climate

Meteorological data collected at the Phoenix Airport are used to describe the climate of the Luke AFB project area (WRCC 2007a, 2007b, 2010).

Temperature. Maricopa County is known for extreme heat in the summer months and mild conditions during the winter. The average high and low temperatures during the summer months at Luke AFB range from about 105 degrees Fahrenheit (°F) to 73 °F. The average high and low temperatures during the winter months range from 70 °F to 42 °F (WRCC 2010).

Precipitation. Average annual precipitation for Luke AFB is 7.5 inches. Annual precipitation in the region occurs during two peak periods: (1) in the summer months (July through September) due to monsoonal flow and (2) during the winter due to polar storm systems. The peak monthly average rainfall of 1.0 inch occurs in August. Spring is the driest season, as the lowest monthly average of 0.1 inches occurs in June. Snowfalls in the region are rare and minimal (WRCC 2010).

Prevailing Winds. The annual average wind speed at Luke AFB is 6.3 miles per hour. April through August experience the strongest winds, with a monthly average speed of 7.5 miles per hour during this period. The prevailing wind direction is from the west from May through July and from the east for the remainder of the year.

Applicable Regulations and Standards

Federal Regulations. The project region within Maricopa County includes a maintenance area for the Federal CO standard, a serious nonattainment area for the PM_{10} standard, and a nonattainment area for the 8-hour O_3 standard. Therefore, the requirements of the EPA General Conformity Rule are applicable to VOC, CO, NO_X, and PM_{10} emissions that would occur from the F-35A beddown scenarios within these areas. The applicable conformity *de minimis* thresholds for these areas are 100 tons per year of VOCs, CO, and NO_X and 70 tons of PM_{10}. If emissions from the F-35A beddown scenarios exceed one of these conformity thresholds, the Air Force must demonstrate that these emissions would conform to the SIP through application of one or more of the criteria for determining conformity of general Federal actions prescribed in Title 40 of the *Code of Federal Regulations* (CFR), Section 93.158, under the procedures prescribed in 40 CFR, Section 93.159.

State Regulations. ADEQ is responsible for enforcing air pollution regulations in Arizona. However, the Maricopa County AQD regulates air quality in Maricopa County.

Several states have promulgated laws as a means of reducing statewide levels of greenhouse gas emissions. The State of Arizona has developed the Climate Change Action Plan for this purpose (Arizona Climate Change Advisory Group 2006). Groups of states, such as the Western Climate Initiative (with Arizona as a founding member), also have formed regionally based collectives to jointly address greenhouse gas pollutants.

Local Regulations. The Maricopa Association of Governments (MAG) has developed air quality plans designed to reduce emissions to a level that will bring Maricopa County into attainment of the NAAQS. Control measures proposed in the air quality plans and adopted by the Maricopa County AQD are incorporated into the Maricopa County Air Pollution Control Regulations (Maricopa County AQD 2010).

The current PM_{10} SIP for the project regions is the *Revised Maricopa Association of Governments 1999 Serious Area Particulate Plan for* PM_{10} *for the Maricopa County Nonattainment Area* (MAG 1999), which the EPA approved in 2002. Due to the inability of the county to attain the PM_{10} standard, the MAG developed the *Maricopa Association of Governments 2007 Five Percent Plan for* PM_{10} *for the Maricopa County Nonattainment Area* (*Five Percent Plan*) (MAG 2007a). The *Five Percent Plan* requires PM_{10} emission reductions of at least 5 percent per year within Maricopa County until attainment of the standard. The dispersion modeling analyses presented in this plan demonstrated that, with additional control measures, the region would attain the PM_{10} standard by 2010. The ADEQ submitted the *Five Percent Plan* to the EPA on December 21, 2007, prior to the December 31, 2007 deadline. On January 25, 2011, prior to final action on the plan by the EPA, Arizona withdrew the submitted plan from EPA consideration. This action triggered an 18-month clock for mandatory application of sanctions and a 2-year clock for EPA to develop a Federal Implementation Plan (FIP) for Maricopa County, unless EPA approves a PM_{10} plan submittal from the ADEQ within 2 years of these EPA findings (February 14, 2011) (EPA 2010).

On June 14, 2005, the EPA approved a 1-hour O_3 maintenance plan for Maricopa County (MAG 2004) and redesignated the region as in attainment of the 1-hour O_3 NAAQS (EPA 2005a). However, the EPA revoked the 1-hour O_3 standard on June 15, 2005, and designated the Maricopa County area in nonattainment of the 8-hour O_3 NAAQS. This ruling required that nonattainment areas meet the 1997 8-hour O_3 NAAQS (0.084 parts per million) by 2009. To satisfy this requirement, the MAG submitted the *Eight-Hour Ozone Plan for the Maricopa Nonattainment Area* to the EPA in June 2007 (MAG 2007b). The EPA has yet to respond to this plan. On May 27, 2008, the EPA revised the 8-hour O_3 NAAQS down to 0.075 parts per million. The planning process to attain this 2008 O_3 standard is on hold, as the EPA proposes to finalize another revision of the 8-hour O_3 NAAQS by August 2011.

The current O_3 SIP for the project region is the *One-Hour Ozone Redesignation Request and Maintenance Plan for the Maricopa County Nonattainment Area, March 2004* (MAG 2004), which the EPA approved in 2005. This O_3 SIP utilized the *1999 Periodic Ozone Emissions Inventory for the Maricopa County, Arizona, Nonattainment Area* (Maricopa County AQD 2002) to establish the 1999 base case in the SIP. The project air quality analysis uses this scenario to define the project air quality base case conditions.

LU 3.3.1.2 Base Environmental Consequences

Air quality impacts from the F-35A beddown at Luke AFB were reviewed in light of Federal, state, and local air pollution standards and regulations. For the purposes of this analysis, if project emissions exceeded a threshold requiring a conformity determination in the Maricopa County project region (e.g., 100 tons per year of VOCs, CO, or NO_X or 70 tons per year of PM_{10}), further analysis was conducted to determine whether impacts would be significant. In such cases, if emissions conform to the approved SIP, impacts would be less than significant. In the case of criteria pollutants for which the Maricopa County project region is in attainment of an NAAQS (NO_2, SO_2, and $PM_{2.5}$), the analysis used the Prevention of Significant Deterioration (PSD) threshold for new major sources of 250 tons per year as an indicator of significance or insignificance of projected air quality impacts.

Construction

The beddown of F-35A aircraft at Luke AFB would require construction and/or renovation of airfield facilities to accommodate the basing decision, including training facilities, hangars, taxiways, and maintenance and fueling facilities. Air quality impacts from projected construction activities would result from (1) combustive emissions due to the use of fossil-fuel-powered equipment and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) due to the operation of equipment on exposed soil. Construction activity data developed by Air Force staff were used to estimate projected construction equipment usages and associated combustive and fugitive dust emissions (Air Force 2010a).

Factors needed to derive construction source emission rates were obtained from *Compilation of Air Pollutant Emission Factors, AP-42, Volume I* (EPA 1995); the EPA NONROAD Model for nonroad construction equipment (EPA 2009); and the MOBILE6.2 Model for on-road vehicles (EPA 2003).

The analysis reduced fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels to simulate implementation of Best Management Practices (BMPs) for fugitive dust control. Chapter 3, Section 3.3, of this EIS lists these BMPs.

Table LU 3.3–3 presents estimates of emissions from construction activities that would occur under Scenario L6 at Luke AFB. These data show that for each year of construction, total CO, NO_X, VOC, and PM_{10} emissions would be well below their applicable conformity *de minimis* thresholds. Maricopa County is in attainment of the NAAQS for NO_2, SO_2, and $PM_{2.5}$, and conformity *de minimis* thresholds do not apply for these pollutants or their precursors. When compared with the PSD thresholds used to indicate significance or insignificance, annual construction emissions fall well below these indicators. Therefore, temporary construction emission impacts on regional air quality are not expected to be significant. The main sources of PM_{10}/$PM_{2.5}$ emissions would occur as fugitive dust from the operation of equipment on unpaved surfaces. With the arrival of the first F-35A aircraft in 2014, the significance of projected construction emissions were evaluated in combination with the simultaneous occurrence of projected operational emissions.

Table LU 3.3–3. Scenario L6 Total Construction Emissions

	Air Pollutant Emissions (tons)						
Construction Year	**VOCs**	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
2012	0.65	3.38	5.44	0.14	5.24	1.02	709.03
2013	0.09	0.47	0.78	0.02	0.43	0.11	107.94
2014	0.14	0.75	1.24	0.03	0.57	0.17	180.60
2015	0.13	0.63	1.11	0.03	0.68	0.17	177.06
2016	0.04	0.21	0.39	0.01	0.17	0.05	74.54
2017	0.05	0.26	0.46	0.02	0.23	0.07	89.20
Total Emissions	**1.10**	**5.70**	**9.42**	**0.25**	**7.32**	**1.59**	**1,338**
Maricopa County PSD and Conformity Thresholds	**100**	**100**	**100**	**250**	**70**	**250**	**N/A**

Operations

The air quality impact analysis of F-35A aircraft operations at Luke AFB is based upon the net change in emissions resulting from the replacement of existing F-16 operations with F-35A operations. The F-16 scenario starting point for the base case period for comparison to F-35A operations is 1999, as proposed operations at Luke AFB are subject to the base case requirements of the Maricopa County O_3 SIP (year 1999). Therefore, the net change in annual operational emissions associated with the beddown of F-35A aircraft at Luke AFB is equal to emissions from the F-35A action for a given year minus emissions from F-16 operations replaced at that time.

Sources associated with the beddown of F-35A aircraft at Luke AFB would include (1) operations of transient aircraft not based at Luke AFB (including general aviation, air carrier, and military aircraft), (2) operations and engine maintenance/testing of F-35A aircraft, (3) onsite POVs and GOVs, (4) offsite POV commutes, (5) AGE, (6) nonroad mobile equipment, and

(7) stationary and other sources. Operational data used to calculate projected F-35A aircraft emissions at Luke AFB were obtained from data used in the project noise analyses (see Section LU 3.2).

Emissions from projected AGE usages are based upon legacy AGE usages for F-16 aircraft and new AGE usages projected for F-35A aircraft. Emissions from POV, GOV, nonroad, and stationary source categories were estimated by multiplying emissions from 1999 base case operations by the ratio of the projected F-35A and actual 1999 Luke AFB F-16 populations. To estimate emissions from POVs, GOVs, and nonroad mobile equipment, the analysis took into consideration MOBILE6.2 and NONROAD emission factors for the 1999 base case and future year scenarios. Emissions from transient aircraft for the projected build-out scenarios were based upon the average of the two highest years of annual operations that occurred between 2000 and 2010 (years 2000 and 2001) (Luke AFB Transient Alert 2011). This is a conservative approach, as transient aircraft operations at Luke AFB have generally declined during this period. Lastly, emissions associated with the future year scenario of F-16 aircraft operations were obtained from an analysis of Luke AFB base case emissions (56th Fighter Wing, Luke AFB 2010).

Tables LU 3.3–4 through LU 3.3–9 summarize the net change in annual emissions that would occur under Scenarios L1 through L6 and the 1999 base case. These data show that each basing action would reduce emissions of all pollutants. Because each basing action would not exceed any applicable conformity or National Environmental Policy Act (NEPA) significance threshold, these actions would produce less than significant air quality impacts.

Table LU 3.3–4. Scenario L1 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Construction	0.14	0.75	1.24	0.03	0.57	0.17	181
F-35A Operations and AGE	2.47	89.33	42.23	5.94	0.85	0.85	19,571
Transient Aircraft	8.61	24.08	6.59	0.76	0.19	0.18	1,497.07
GOVs	0.15	1.18	0.38	0.04	0.06	0.06	1,477
POVs	3.37	34.70	2.44	0.41	0.20	0.19	20,730
Nonroad	4.09	38.76	6.02	0.14	1.27	1.23	45,445
Point and Area Sources	3.69	1.61	1.66	0.42	0.37	0.34	21
F-16 Operations – All Sources	40.58	211.91	94.50	7.56	6.51	6.39	94,540
Total Projected Emissions – Scenario L1	**63.10**	**402.32**	**155.06**	**15.32**	**10.02**	**9.41**	**183,461**
Year 1999 Base Case Emissions	**499.63**	**1,882.06**	**635.02**	**73.34**	**47.21**	**45.84**	**789,009**
Scenario L1 Minus Base Case Emissions	**(436.52)**	**(1,479.74)**	**(479.96)**	**(58.02)**	**(37.19)**	**(36.43)**	**(605,548)**
Maricopa County PSD and Conformity Thresholds	**100**	**100**	**100**	**250**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

Note: (Number) denotes a negative number.

Table LU 3.3–5. Scenario L2 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Construction	0.13	0.63	1.11	0.03	0.68	0.17	177
F-35A Operations and AGE	4.93	178.65	84.46	11.88	1.70	1.70	39,143
Transient Aircraft	8.61	24.08	6.59	0.76	0.19	0.18	1,497.07
GOVs	0.29	2.28	0.69	0.08	0.13	0.12	2,953
POVs	6.28	67.12	4.50	0.83	0.41	0.37	41,460
Nonroad	7.53	70.31	11.26	0.28	2.37	2.30	90,890
Point and Area Sources	7.39	3.21	3.33	0.84	0.73	0.67	42
F-16 Operations – All Sources	40.58	211.91	94.50	7.56	6.51	6.39	94,540
Total Projected Emissions – Scenario L2	**75.74**	**558.20**	**206.43**	**22.27**	**12.71**	**11.91**	**270,701**
Year 1999 Base Case Emissions	**499.63**	**1,882.06**	**635.02**	**73.34**	**47.21**	**45.84**	**789,009**
Scenario L2 Minus Base Case Emissions	**(423.89)**	**(1,323.86)**	**(428.58)**	**(51.07)**	**(34.50)**	**(33.93)**	**(518,308)**
Maricopa County PSD and Conformity Thresholds	**100**	**100**	**100**	**250**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

Note: (Number) denotes a negative number.

Table LU 3.3–6. Scenario L3 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Construction	0.04	0.21	0.39	0.01	0.17	0.05	75
F-35A Operations and AGE	7.40	267.98	126.68	17.82	2.55	2.55	58,714
Transient Aircraft	8.61	24.08	6.59	0.76	0.19	0.18	1,497.07
GOVs	0.41	3.31	0.96	0.12	0.19	0.17	4,430
POVs	8.84	97.75	6.22	1.24	0.61	0.56	62,190
Nonroad	10.32	94.65	15.72	0.41	3.30	3.20	136,334
Point and Area Sources	11.08	4.82	4.99	1.26	1.10	1.01	62
F-16 Operations – All Sources	40.58	211.91	94.50	7.56	6.51	6.39	94,540
Total Projected Emissions – Scenario L3	**87.28**	**704.71**	**256.04**	**29.20**	**14.61**	**14.12**	**357,842**
Year 1999 Base Case Emissions	**499.63**	**1,882.06**	**635.02**	**73.34**	**47.21**	**45.84**	**789,009**
Scenario L3 Minus Base Case Emissions	**(412.35)**	**(1,177.35)**	**(378.97)**	**(44.14)**	**(32.60)**	**(31.72)**	**(431,167)**
Maricopa County PSD and Conformity Thresholds	**100**	**100**	**100**	**250**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

Note: (Number) denotes a negative number.

Table LU 3.3–7. Scenario L4 Annual Operational Emissions

	Air Pollutant Emissions (tons per year)						
Activity	**VOCs**	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Construction	0.05	0.26	0.46	0.02	0.23	0.07	89
F-35A Operations and AGE	9.87	357.31	168.91	23.76	3.40	3.40	78,285
Transient Aircraft	8.61	24.08	6.59	0.76	0.19	0.18	1,497.07
GOVs	0.52	4.30	1.20	0.17	0.25	0.23	5,907
POVs	11.13	127.30	7.72	1.66	0.81	0.75	82,919
Nonroad	12.46	111.78	19.40	0.54	4.05	3.93	181,779
Point and Area Sources	14.77	6.42	6.65	1.68	1.46	1.34	83
F-16 Operations – All Sources	40.58	211.91	94.50	7.56	6.51	6.39	94,540
Total Projected Emissions – Scenario L4	**97.99**	**843.36**	**305.43**	**36.15**	**16.90**	**16.30**	**445,100**
Year 1999 Base Case Emissions	**499.63**	**1,882.06**	**635.02**	**73.34**	**47.21**	**45.84**	**789,009**
Scenario L4 Minus Base Case Emissions	**(401.64)**	**(1,038.69)**	**(329.58)**	**(37.20)**	**(30.30)**	**(29.54)**	**(343,909)**
Maricopa County PSD and Conformity Thresholds	**100**	**100**	**100**	**250**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

Note: (Number) denotes a negative number.

Table LU 3.3–8. Scenario L5 Annual Operational Emissions

	Air Pollutant Emissions (tons per year)						
Activity	**VOCs**	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
F-35A Operations and AGE	12.34	446.64	211.14	29.70	4.26	4.26	97,856
Transient Aircraft	8.61	24.08	6.59	0.76	0.19	0.18	1,497.07
GOVs	0.63	5.23	1.42	0.24	0.31	0.29	7,383
POVs	13.20	155.75	9.04	2.07	1.02	0.93	103,649
Nonroad	15.58	139.72	24.25	0.67	5.07	4.92	227,224
Point and Area Sources	18.47	8.03	8.31	2.10	1.83	1.68	104
F-16 Operations – All Sources	40.58	211.91	94.50	7.56	6.51	6.39	94,540
Total Projected Emissions – Scenario L5	**109.39**	**991.36**	**355.25**	**43.11**	**19.17**	**18.65**	**532,254**
Year 1999 Base Case Emissions	**499.63**	**1,882.06**	**635.02**	**73.34**	**47.21**	**45.84**	**789,009**
Scenario L5 Minus Base Case Emissions	**(390.23)**	**(890.70)**	**(279.77)**	**(30.23)**	**(28.03)**	**(27.19)**	**(256,755)**
Maricopa County PSD and Conformity Thresholds	**100**	**100**	**100**	**250**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

Note: (Number) denotes a negative number.

Table LU 3.3–9. Scenario L6 Annual Operational Emissions

Activity	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	14.80	535.96	253.37	35.64	5.11	5.11	117,428
Transient Aircraft	8.61	24.08	6.59	0.76	0.19	0.18	1,497.07
GOVs	0.74	6.20	1.67	0.25	0.38	0.35	8,860
POVs	15.52	185.34	10.57	2.49	1.22	1.12	124,379
Nonroad	18.69	167.67	29.10	0.81	6.08	5.90	272,669
Point and Area Sources	22.16	9.64	9.98	2.53	2.19	2.02	125
F-16 Operations – All Sources	40.58	211.91	94.50	7.56	6.51	6.39	94,540
Total Projected Emissions – Scenario L6	**121.10**	**1,140.81**	**405.77**	**50.03**	**21.67**	**21.07**	**619,497**
Year 1999 Base Case Emissions	**499.63**	**1,882.06**	**635.02**	**73.34**	**47.21**	**45.84**	**789,009**
Scenario L6 Minus Base Case Emissions	**(378.52)**	**(741.25)**	**(229.25)**	**(23.31)**	**(25.54)**	**(24.77)**	**(169,512)**
Maricopa County PSD and Conformity Thresholds	**100**	**100**	**100**	**250**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

Note: (Number) denotes a negative number.

In addition to presenting estimates of greenhouse gas emissions that would occur under the F-35A beddown scenarios at Luke AFB, the following considers how climate change could impact the F-35A beddown scenarios at Luke AFB and what adaptation strategies, if any, would be required to respond to these future conditions. For Luke AFB, the main effect of climate change to consider is increased aridity, as documented in *Global Climate Change Impacts in the United States* (USGCRP 2009). This report predicts that in the future, the southwest will experience increased droughts, temperatures, wildfires, and scarcities of water supplies. Operations at Luke AFB have adapted to droughts, high temperatures, and scarce water supplies. However, exacerbation of these conditions in the future would increase the cost of proposed operations at Luke AFB and would impede operations during extreme events. Additional measures would be needed to mitigate these occurrences. Due to its suburban surroundings, an increase in wildfires in the region would have little to no effect on operations at Luke AFB other than the possibility of an increase in smoke obscurations. However, the auxiliary airfields within remote areas in proximity to Luke AFB may have to consider additional measures to protect infrastructure and personnel from increased wildfires.

LU 3.3.2 Airspace

LU 3.3.2.1 Airspace Affected Environment

Projected F-35A aircraft operations within auxiliary airfields, training areas, and aircraft flight routes between these locations and Luke AFB would affect air quality within portions of central and southern Arizona. Most of the regions below and adjacent to these airspace units currently attain all of the NAAQS. Areas that do not attain an NAAQS or are maintenance areas for these standards include the (1) Ajo SO_2 maintenance area, (2) Ajo PM_{10} moderate nonattainment area, (3) Rillito Planning Area PM_{10} moderate nonattainment area, (4) Pima County PM_{10} nonattainment area, (5) Pinal/Gila Counties PM_{10} nonattainment area, (6) Hayden SO_2 nonattainment area, (7) Hayden Planning Area PM_{10} moderate nonattainment area, and (8) the Maricopa County PM_{10} serious nonattainment and 8-hour O_3 basic nonattainment areas.

Requirements for Class I Areas. As part of the PSD Regulation, the Federal Clean Air Act provides special protection for air quality and air-quality-related values (including visibility and pollutant deposition) in selected areas of the United States (national parks greater than 6,000 acres or national wilderness areas greater than 5,000 acres). These Class I areas are areas where any appreciable deterioration of air quality is considered significant. In 1999, the EPA promulgated a regional haze regulation that requires states to establish goals and emission reduction strategies to make initial improvements in visibility within their respective Class I areas (EPA 1999). Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Military training routes VR-239, VR-241, and VR-244, proposed for use by the F-35A aircraft, are in close proximity to or overlie the following pristine Class I areas: (1) Saguaro National Park, (2) Superstition Wilderness Area, (3) Sierra Ancha Wilderness Area, (4) Mazatzal Wilderness Area, and (5) Pine Mountain Wilderness Area. Criteria to determine the significance of air quality impacts within Class I areas usually pertain to stationary emission sources, as mobile sources are generally exempt from permit review by regulatory agencies. However, Section 169A of the Clean Air Act states the Federal goal of prevention of any future impairment of visibility within Class I areas from manmade sources of air pollution. Therefore, due to the proximity of these pristine areas to projected aircraft operations, this EIS provides a qualitative analysis of the potential for projected emissions to affect visibility within these areas.

Table LU 3.3–10 presents an estimation of annual emissions due to F-16 aircraft operations within the Luke AFB airspace units during the base case year of 2009. Because existing F-16 aircraft operations within the Gladden, Bagdad, and Sells MOAs/ATCAAs occur at least 3,000 feet AGL, no emissions are presented for these airspace units. Table LU 3.3–10 also presents the reduction in emissions that would occur from the future drawdown of F-16 aircraft operations within the Luke AFB airspace units compared to current levels.

Table LU 3.3–10. Annual Emissions from F-16 Operations within Luke AFB Airspace Units, 2009 Base Case

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
R-2301E (BMGR East)	5.84	2.19	74.35	2.41	2.57	2.57	8,124
BMGR TAC Ranges	26.26	9.82	334.06	10.85	11.53	11.53	36,500
VR-239	2.62	0.98	33.35	1.08	1.15	1.15	3,643
VR-245	1.34	0.50	17.08	0.55	0.59	0.59	1,866
VR-223	4.39	1.64	55.80	1.81	1.93	1.93	6,096
VR-231	3.28	1.23	41.70	1.35	1.44	1.44	4,556
VR-241	0.69	0.26	8.78	0.29	0.30	0.30	960
VR-242	0.22	0.08	2.84	0.09	0.10	0.10	310
VR-243	0.98	0.37	12.46	0.40	0.43	0.43	1,361
VR-244	2.61	0.98	33.22	1.08	1.15	1.15	3,630
Aux-1	13.41	4.47	95.70	3.91	4.45	4.45	13,162
Gila Bend AFAF	1.31	1.68	12.09	0.43	0.41	0.41	1,442
Total Existing Emissions	**62.28**	**23.94**	**712.83**	**23.98**	**25.75**	**25.75**	**80,712**
F-16 Future Reductions[1]	**(46.89)**	**(18.10)**	**(525.50)**	**(17.82)**	**(19.18)**	**(19.18)**	**(59,964)**

[1] Equal to total airspace F-16 future drawdown scenario minus 2009 base case emissions. Only includes emissions for aircraft operations that occur below 3,000 feet AGL.
Note: (Number) denotes a negative number.

LU 3.3.2.2 Airspace Environmental Consequences

Most of the regions below and adjacent to airspace units proposed for use by F-35A aircraft in central and southern Arizona currently attain all of the NAAQS. However, there are several areas in this region that are in maintenance or moderate nonattainment of an NAAQS. Airspace units where F-35A aircraft would operate below 3,000 feet AGL and therefore would directly affect these areas Most of the regions below and adjacent to airspace units proposed for use by F-35A aircraft in central and southern Arizona currently attain all of the NAAQS. However, there are several areas in this region that are in maintenance or moderate nonattainment of an NAAQS. Airspace units where F-35A aircraft would operate below 3,000 feet AGL and therefore would directly affect these areas include the following:

- The eastern portion of R-2301E, which extends into the Ajo PM_{10} nonattainment and SO_2 maintenance areas.
- VR-223, whose initial segment passes through the Maricopa County 8-hour O_3 nonattainment area.
- VR-231, which ends in the Maricopa County 8-hour O_3 nonattainment area.
- VR-239, which overlies the Rillito Planning Area PM_{10} moderate nonattainment area, Hayden SO_2 nonattainment area, and Hayden Planning Area PM_{10} moderate nonattainment area.

- VR-241, which traverses the Pima County PM_{10} nonattainment area, the Pinal/Gila Counties PM_{10} nonattainment area, the Maricopa County 8-hour O_3 nonattainment area, and the northeast corner of the Maricopa County PM_{10} nonattainment area.

- VR-242, which crosses the southwest corner of the Maricopa County 8-hour O_3 nonattainment area.

- VR-244, which traverses the Ajo SO_2 maintenance and PM_{10} nonattainment areas, the Pima County PM_{10} nonattainment area, the Pinal/Gila Counties PM_{10} nonattainment area, the Maricopa County 8-hour O_3 nonattainment area, and the northeast corner of the Maricopa County PM_{10} nonattainment area.

- Aux-1, which occurs within the Maricopa County PM_{10} serious nonattainment and 8-hour O_3 nonattainment areas.

For the purposes of this analysis, if projected emissions within any airspace unit were estimated to remain below a conformity threshold for these nonattainment areas (100 tons per year of VOCs, NO_X, or SO_2 and 70 tons per year of PM_{10}), these emissions would produce less than significant impacts. For criteria pollutants for which the airspace units are in attainment of an NAAQS (CO and $PM_{2.5}$), the analysis used the PSD threshold for new major sources of 250 tons per year as an indicator of significance or insignificance of projected air quality impacts. If projected emissions exceed one of these levels, further analyses were conducted to determine whether impacts were significant. The analysis also evaluated how projected emissions would affect air quality within Federal Class I areas that are adjacent to airspace units.

Operations

The air quality impact analysis of F-35A aircraft operations within the Luke AFB primary use airspace is based upon the net change in emissions resulting from the replacement of existing F-16 operations with F-35A operations. The F-16 scenario starting point for the base case period for comparison to F-35A operations is 2009, as operations within primary use airspace are not subject to the base case requirements (1999) associated with the Maricopa County O_3 SIP. Therefore, the net change in annual operational emissions within the airspace units is equal to emissions from the F-35A action for a given year minus emissions from F-16 operations replaced at that time.

Sources associated with the beddown of F-35A aircraft within the Luke AFB airspace units and aircraft flight routes would include inflight F-35A aircraft operations. Operational data used to calculate projected F-35A aircraft emissions are consistent with data used in the project noise analyses (see Section LU 3.2).

Tables LU 3.3–11, LU 3.3–12, LU 3.3–13, and LU 3.3–14 summarize the annual emissions that would occur under the milestone Scenarios L1, L3, L5, and L6, respectively, within the Luke AFB primary use airspace. Because proposed aircraft operations within the Gladden, Bagdad, and Sells MOAs/ATCAAs would occur at least 3,000 feet AGL, no emissions are presented for these airspace units. These data show that operation of F-35A aircraft within the airspace units would decrease emissions of all criteria pollutants from current F-16 levels under all Luke AFB F-35A beddown scenarios, except that Scenario L6 would produce a nominal increase in emissions of SO_2. As a result, these actions would produce annual emissions that would not exceed any applicable conformity or NEPA significance threshold. Therefore, F-35A operations within the Luke AFB primary use airspace would produce less than significant impacts on NAAQS pollutant levels.

Table LU 3.3–11. Scenario L1 Annual Operational Emissions within Luke AFB Airspace Units

	Air Pollutant Emissions (tons per year)						
Activity Type	**VOCs**	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
R-2301E (BMGR East)	0.00	0.03	1.94	0.08	0.01	0.01	270
BMGR TAC Ranges	0.00	0.15	8.51	0.36	0.04	0.04	1,182
VR-239	0.00	0.15	8.57	0.37	0.04	0.04	1,191
VR-245	0.00	0.11	6.00	0.26	0.03	0.03	834
VR-223	0.00	0.03	1.95	0.08	0.01	0.01	271
VR-231	0.00	0.03	1.62	0.07	0.01	0.01	225
VR-241	0.00	0.01	0.36	0.02	0.00	0.00	51
VR-242	0.00	0.01	0.36	0.02	0.00	0.00	51
VR-243	0.00	0.01	0.45	0.02	0.00	0.00	62
VR-244	0.00	0.01	0.45	0.02	0.00	0.00	63
Aux-1	0.05	1.42	13.60	1.18	0.10	0.10	3,836
Gila Bend AFAF	0.01	0.50	9.03	0.59	0.05	0.05	1,913
Total Projected Emissions	**0.06**	**2.46**	**53.14**	**3.06**	**0.29**	**0.29**	**9,988**
F-16 Future Reductions[1]	**46.89)**	**(18.10)**	**(525.50)**	**(17.82)**	**(19.18)**	**(19.18)**	**(59,964)**
Net Change in Emissions	**(46.83)**	**(15.64)**	**(472.35)**	**(14.76)**	**(18.89)**	**(18.89)**	**(49,977)**
Conformity and PSD Thresholds	**100**	**250**	**100**	**100**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

[1] Equal to total airspace F-16 future drawdown scenario minus base case emissions. Only includes emissions for aircraft operations that occur below 3,000 feet AGL.

Note: (Number) denotes a negative number.

Table LU 3.3–12. Scenario L3 Annual Operational Emissions within Luke AFB Airspace Units

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e}
R-2301E (BMGR East)	0.00	0.10	5.82	0.25	0.03	0.03	809
BMGR TAC Ranges	0.00	0.45	25.53	1.09	0.11	0.11	3,547
VR-239	0.00	0.46	25.72	1.10	0.12	0.12	3,573
VR-245	0.00	0.32	18.00	0.77	0.08	0.08	2,501
VR-223	0.00	0.10	5.84	0.25	0.03	0.03	812
VR-231	0.00	0.09	4.86	0.21	0.02	0.02	675
VR-241	0.00	0.02	1.09	0.05	0.00	0.00	152
VR-242	0.00	0.02	1.09	0.05	0.00	0.00	152
VR-243	0.00	0.02	1.35	0.06	0.01	0.01	187
VR-244	0.00	0.02	1.36	0.06	0.01	0.01	189
Aux-1	0.14	4.25	40.81	3.53	0.30	0.30	11,507
Gila Bend AFAF	0.03	1.51	27.08	1.76	0.16	0.16	5,740
Total Projected Emissions	**0.19**	**7.39**	**159.43**	**9.18**	**0.88**	**0.88**	**29,963**
F-16 Future Reductions[1]	**(46.89)**	**(18.10)**	**(525.50)**	**(17.82)**	**(19.18)**	**(19.18)**	**(59,964)**
Net Change in Emissions	**(46.70)**	**(10.71)**	**(366.07)**	**(8.63)**	**(18.30)**	**(18.30)**	**(30,001)**
Conformity and PSD Thresholds	**100**	**250**	**100**	**100**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

[1] Equal to total airspace F-16 future drawdown scenario minus base case emissions. Only includes emissions for aircraft operations that occur below 3,000 feet AGL.

Note: (Number) denotes a negative number.

Table LU 3.3–13. Scenario L5 Annual Operational Emissions within Luke AFB Airspace Units

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e}
R-2301E (BMGR East)	0.00	0.17	9.71	0.41	0.04	0.04	1,349
BMGR TAC Ranges	0.01	0.76	42.55	1.81	0.19	0.19	5,911
VR-239	0.01	0.76	42.87	1.83	0.19	0.19	5,955
VR-245	0.00	0.53	30.01	1.28	0.13	0.13	4,168
VR-223	0.00	0.17	9.74	0.41	0.04	0.04	1,353
VR-231	0.00	0.14	8.10	0.34	0.04	0.04	1,125
VR-241	0.00	0.03	1.82	0.08	0.01	0.01	253
VR-242	0.00	0.03	1.82	0.08	0.01	0.01	253
VR-243	0.00	0.04	2.25	0.10	0.01	0.01	312
VR-244	0.00	0.04	2.27	0.10	0.01	0.01	315
Aux-1	0.24	7.08	68.01	5.88	0.51	0.51	19,178
Gila Bend AFAF	0.06	2.51	45.14	2.93	0.27	0.27	9,567
Total Projected Emissions	**0.32**	**12.31**	**265.71**	**15.31**	**1.46**	**1.46**	**49,938**
F-16 Future Reductions[1]	**(46.89)**	**(18.10)**	**(525.50)**	**(17.82)**	**(19.18)**	**(19.18)**	**(59,964)**
Net Change in Emissions	**(46.57)**	**(5.79)**	**(259.78)**	**(2.51)**	**(17.72)**	**(17.72)**	**(10,026)**
Conformity and PSD Thresholds	**100**	**250**	**100**	**100**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

[1] Equal to total airspace F-16 future drawdown scenario minus base case emissions. Only includes emissions for aircraft operations that occur below 3,000 feet AGL.

Note: (Number) denotes a negative number.

Table LU 3.3–14. Scenario L6 Annual Operational Emissions within Luke AFB Airspace Units

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
R-2301E (BMGR East)	0.00	0.21	11.65	0.50	0.05	0.05	1,618
BMGR TAC Ranges	0.01	0.91	51.06	2.17	0.23	0.23	7,093
VR-239	0.01	0.92	51.44	2.19	0.23	0.23	7,146
VR-245	0.00	0.64	36.01	1.53	0.16	0.16	5,002
VR-223	0.00	0.21	11.69	0.50	0.05	0.05	1,624
VR-231	0.00	0.17	9.72	0.41	0.04	0.04	1,350
VR-241	0.00	0.04	2.19	0.09	0.01	0.01	304
VR-242	0.00	0.04	2.19	0.09	0.01	0.01	304
VR-243	0.00	0.05	2.70	0.11	0.01	0.01	375
VR-244	0.00	0.05	2.72	0.12	0.01	0.01	378
Aux-1	0.29	8.50	81.61	7.05	0.61	0.61	23,013
Gila Bend AFAF	0.07	3.01	54.17	3.52	0.32	0.32	11,480
Total Projected Emissions	**0.38**	**14.77**	**318.86**	**18.37**	**1.75**	**1.75**	**59,926**
F-16 Future Reductions[1]	**(46.89)**	**(18.10)**	**(525.50)**	**(17.82)**	**(19.18)**	**(19.18)**	**(59,964)**
Net Change in Emissions	**(46.51)**	**(3.33)**	**(206.64)**	**0.55**	**(17.43)**	**(17.43)**	**(38)**
Conformity and PSD Thresholds	**100**	**250**	**100**	**100**	**70**	**250**	**N/A**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

[1] Equal to total airspace F-16 future drawdown scenario minus base case emissions. Only includes emissions for aircraft operations that occur below 3,000 feet AGL.

Note: (Number) denotes a negative number.

Since the operation of F-35A aircraft within primary use airspace would decrease emissions of all criteria pollutants from current F-16 levels for all Luke AFB basing scenarios or would only produce a nominal increase in emissions of SO_2 under Scenario L6, these actions would produce less than significant contributions to visibility impairment within the regional Class I areas.

LU 3.4 Safety

LU 3.4.1 Base

LU 3.4.1.1 Base Affected Environment

Ground Safety

Day-to-day operations and maintenance activities conducted at Luke AFB are performed in accordance with applicable Air Force safety regulations; published Air Force technical orders; and standards prescribed by Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) requirements. These are intended to standardize procedures and practices in all activities on Air Force property to reduce occupational risks to government personnel and contractors and to protect other persons that reside on or visit the installation or the vicinity of the installation.

Anti-Terrorism/Force Protection (AT/FP). Anti-Terrorism/Force Protection (AT/FP) is a security program designed to protect Air Force active-duty personnel, civilian employees, family members, and facilities and equipment in all locations and situations. The program is accomplished through the planned and integrated application of anti-terrorism measures, physical security, operations security, and personal protective services. It is supported by intelligence, counterintelligence, and other security programs. In response to terrorist attacks, several regulations have been promulgated to ensure that force protection standards are incorporated into the planning, programming, and budgeting for the design and construction of military construction-funded facilities. *DoD Minimum Antiterrorism Standards for Buildings* (UFC 04-010-01) (DoD 2003), published in 2003 and updated in 2007, establishes minimum standoff distances that must be maintained between several categories of structures and areas that are relatively accessible to terrorists.

The intent of this siting and design guidance is to improve security, minimize fatalities, and limit damage to facilities in the event of a terrorist attack. Many military installations, such as Luke AFB, were developed before AT/FP considerations became a critical concern. Thus, under current conditions, many installations are not able to comply with all present AT/FP standards. However, as new construction occurs, these standards would be incorporated into the design, and as facilities are modified, AT/FP standards would be incorporated to the maximum extent practicable.

Airfield Safety

Luke AFB is located at 33° 32′ 06″ north and 112° 22′ 59″ west, with a field elevation of 1,085 feet MSL. The airfield consists of two parallel runways (staggered approximately 0.5 miles from each other) oriented on magnetic bearings of 31.2° and 211.2° (northeast to southwest). Runway 3R/21L is 9,904 feet long by 150 feet wide and is composed of asphalt construction in the middle 5,400 feet and concrete at the approach ends. Runway 3L/21R is 10,012 feet long by 150 feet wide and is composed of Porous European Mix (PEM) pavement. Both runways have high-intensity runway edge lights. Runway 21L/3R has a 3,000-foot Approach Lighting System with Sequence Flashing Lights (ALSF-1) on both ends, which includes centerline sequenced flashers (AirNav 2010; FAA 2010b).

Taxiway C provides access from the apron area to Runway 3L and Runway 3R; Taxiway A provides access to Runway 21R. Runway 21L can be directly accessed from the main apron area.

Airspace at Luke AFB is managed in accordance with Air Force Instruction (AFI) 13-201, *Air Force Airspace Management* (Air Force 2006a), which implements Air Force Planning Document 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management* (Air Force 2007), and DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation and National Airspace System Matters* (DoD 1997).

Class D airspace around Luke AFB was modified in May 2007 to protect maneuvering aircraft in the vicinity of the airfield (FAA 2007a). Class D airspace now extends upward from the surface to, but not including, 4,000 feet MSL and within a 5.6-mile radius of Luke AFB from a point intersecting the northwest portion of the Phoenix Goodyear Airport Class D airspace

clockwise to a point intersecting the northern portion of the Glendale Municipal Airport Class D airspace (excluding those portions within the Glendale and Goodyear Class D airspaces, respectively). Class D airspace at Luke AFB is active during published times and dates and other times by NOTAM [Notice to Airmen]. Existing and projected airfield operations are shown in Table LU 2.1–1.

Albuquerque ARTCC controls airspace within the Phoenix metropolitan area, including Luke AFB. Los Angeles ARTCC and Denver ARTCC are responsible for airspace in northern Arizona, and Los Angeles ARTCC is responsible for the airspace to the west. While the Phoenix Terminal Radar Approach Control (TRACON) is responsible for air traffic arriving at and departing from civilian airports within its designated airspace, the Luke AFB RAPCON is responsible for air traffic associated with Luke AFB, including Instrument Flight Rule (IFR)/VFR departures/arrivals into Glendale, IFR/VFR departures/arrivals into and out of Goodyear airport, and IFR/VFR arrivals into Deer Valley airport coming from the west. This division of airspace responsibility requires careful coordination between Phoenix TRACON and Luke AFB RAPCON (Luke AFB 2007a).

The primary public concern with regard to flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of mid-air collisions, collisions with manmade structures or terrain, weather-related accidents, mechanical failure, pilot error, or bird–aircraft collisions. Collisions with structures around the airfield are controlled through airfield setbacks and safety zones that restrict construction around the airfield so that both the ground surface is clear for ground maneuvering and the airspace is clear of obstructions such as groves of trees, poles and power lines, and tall structures. The Air Installation Compatibility Use Zone (AICUZ) defines Accident Potential Zones (APZs) around the airfield and prescribes restrictions on any construction in the Clear Zone (CZ). Land use restrictions are recommended for APZs I and II, based mostly on the number of aircraft operations. That is, activities where people congregate are not recommended, and uses where persons spend a high percentage of time (such as residential) are also not recommended.

Per DoD Instruction 4165.57, *Air Installations Compatible Use Zones* (DoD 1977), Luke AFB has established the following zones to ensure compatible land use and safety in and around the airfield environment: CZ, APZ I, and APZ II (see Figure LU 3.4–1). In addition, the State of Arizona requires the establishment of its own APZs, by way of ARS, which are more stringent than Air Force AICUZ requirements regarding safety zones. The CZs and APZs at the auxiliary airfields (Aux-1 and Gila Bend AFAF), as well as at Luke AFB, are codified in statute.

Clear Zones. CZs at Luke AFB are rectangular areas 3,000 feet long by 3,000 feet wide occurring at each end of the four runways. These are the areas with the highest statistical potential for aircraft accidents. The overall risk is so high that the DoD generally acquires this land through purchase or easement to prevent development. The dimensions of CZs vary according to the type of aircraft assigned to the base. While the majority of the CZs occur within the installation boundary, portions that are located outside this boundary are protected by restrictive CZ easements, and are either open space or agricultural areas. The Air Force holds a number of clearance easements for properties affected by APZ I.

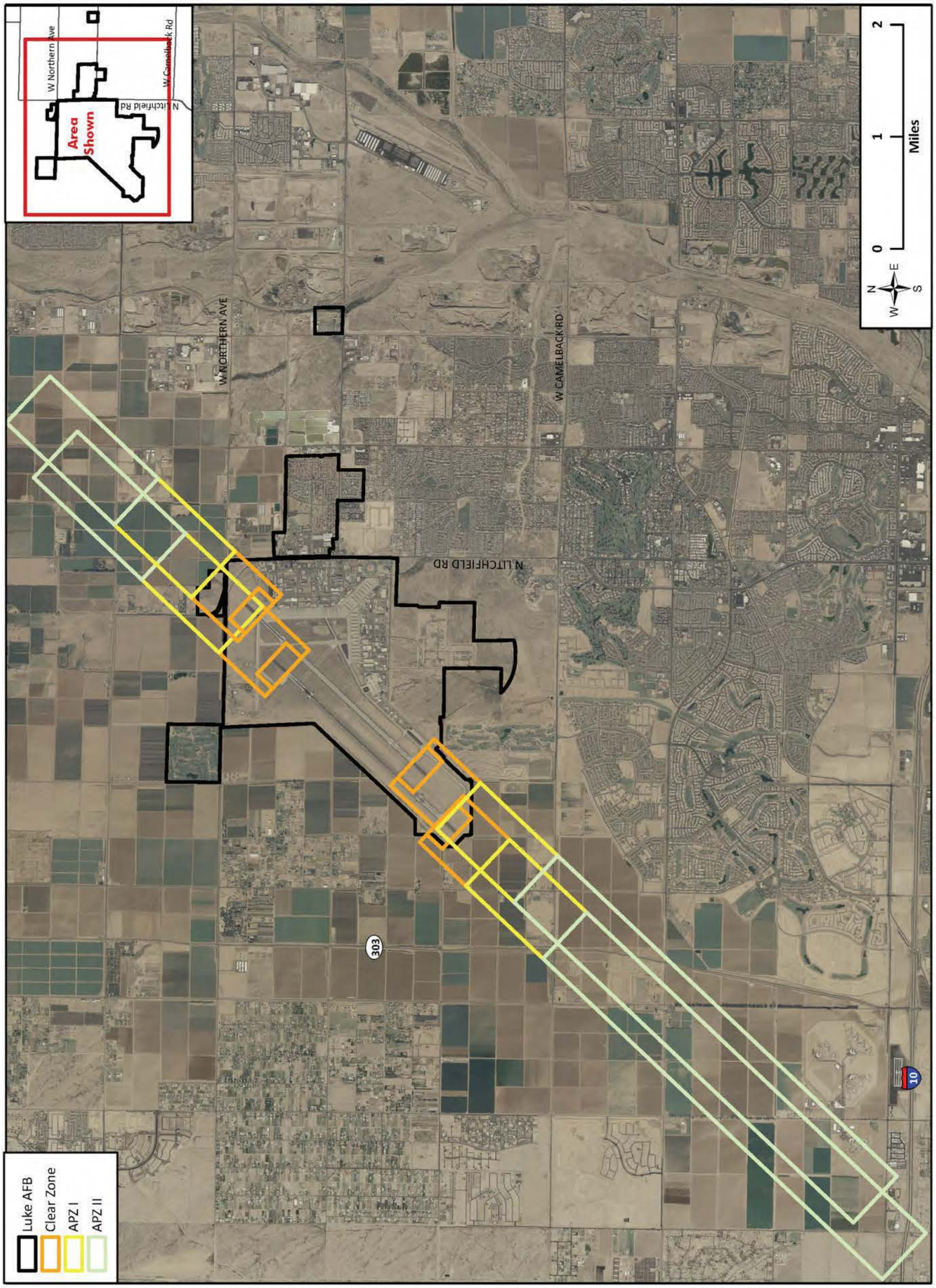


Figure LU 3.4–1. Accident Potential Zones at Luke AFB

APZ I. APZ I at Luke AFB extends 5,000 feet beyond the CZ at either end of the runway and maintains a width of 3,000 feet. The potential for aircraft accidents is statistically lower within APZ I than within the CZ, but it is still substantial. The majority of APZ I extend furthers to the northeast and southwest due to the staggered parallel runway configuration. The Air Force holds a number of clearance easements for properties affected by APZ I.

APZ II. APZ II extends 7,000 feet beyond APZ I at either end of the runway and maintains a width of 3,000 feet. APZ II possesses a lower statistical potential for aircraft accidents than CZ or APZ I, but a risk of aircraft accident is still present. All of APZ II is located in the City of Glendale and also extends further to the northeast and southwest due to the staggered parallel runway configuration.

The High Noise Zone or APZ, as defined by ARS 28-8461, Section 8(a), extends 30,000 feet beyond the runway to the southwest and is 4,000 feet wide. This zone includes the CZ and APZs I and II, but extends an additional 15,000 feet to the southwest, for a total distance of 30,000 feet in that direction. This zone is not found at the northeastern end of the runways. The width is defined such that it extends the APZ II width for both runways, and is therefore 4,000 feet wide rather than 3,000 feet (Luke AFB 2003). The southernmost point of the High Noise Zone or APZ crosses over Interstate 10.

Ground Obstructions. All structures on the ground have the potential to create hazards to flight. The FAA provides detailed instructions for the marking of obstructions (i.e., paint schemes and lighting) to warn pilots of their presence. Any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 feet (61 meters) AGL or exceeds any obstruction standard contained in 14 CFR Part 77, "Objects Affecting Navigable Airspace," should normally be marked and/or lighted. The FAA may also recommend marking and/or lighting a structure that does not exceed 200 feet AGL or 14 CFR Part 77 standards because of its particular location (FAA 2007b). The obstruction standards in 14 CFR Part 77 are primarily focused on structures in the immediate vicinity of airports and approach and departure corridors from airports (14 CFR 77).

Explosives Safety

Luke AFB stores, maintains, and uses a range of munitions required for performance of its training mission. All ordnance is handled and stored in accordance with Air Force explosives safety directives (Air Force Manual 91-201) (Air Force 2011) and Department of Defense Explosives Safety Board (DDESB) standards (DoD 6055.09-STD) (DoD 2005), and all munitions maintenance is carried out by trained, qualified personnel using Air Force–approved technical procedures. Restrictions apply to areas immediately surrounding munitions storage facilities to provide separation between facilities and other activities for safety purposes. Similar restrictions also apply in areas near stationary aircraft that carry munitions. These areas, defined by quantity-distance (Q-D) arcs, vary in size depending on the type and quantity of munitions stored. Setback distances define how close adjacent facilities can be located and inhabited. 56 FW has no explosives/munitions-related waivers, deviations, or exemptions from DDESB Standard 6055.09, *DoD Ammunition and Explosives Safety Standards*, Air Force Manual 91-201, *Explosives Safety Standards*, or command supplements. Additionally, 56 FW has no airfield waivers or waivered encroachments pertaining to explosive Q-D arcs. When in use,

Echo Taxiway Live Munitions Loading Area aircraft parking spots 10 through 14 are within the 1,000-foot centerline CZ of Runway 03R/21L. An airfield waiver allowing use of these parking spots is in place.

Luke Air Force Base Instruction 32-3001, Explosive Ordnance Disposal (EOD) Support (Luke AFB 2009a), governs 56 FW responses and mutual aid in regard to off-base EOD support. Contractors working within explosive Q-D arcs will be advised of the hazard(s) and afforded intra-line separation from munitions as required by DDESB Standard 6055.09 and Air Force Manual 91-201.

Lasers are not explosives, and lasers employed by current aircraft using BMGR provide very accurate training for ordnance delivery. Lasers can be set in eye-safe mode for such training as urban combat. Existing range targets used for training with lasers not set in eye-safe mode are specifically cleared for such training and treated as inert munitions ranges. BMGR ranges have targets designated for laser targeting systems, which are currently used by F-16 and other military aircraft.

LU 3.4.1.2 Base Environmental Consequences

Ground Safety

There are no aspects of various F-35A aircraft basing scenarios for Luke AFB that are expected to create new or unique ground safety issues. Operations and maintenance procedures conducted by base personnel would not change from current conditions. All activities would continue to be conducted in accordance with applicable regulation, technical orders, and AFOSH standards.

Airfield Safety

The Class A rate is not yet determined for the F-35A, and as with any new aircraft, there are always elements of a new system that require testing and evaluation. Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location. Although the F-35A is a relatively new type of aircraft, historical trends show that mishaps of all types decrease the longer an aircraft is operational as flight crews and maintenance personnel learn more about the aircraft's capabilities and limitations. As the F-35A becomes more operationally mature, the aircraft mishap rate is expected to become comparable with a similarly sized aircraft with a similar mission.

The beddown of up to 144 F-35A PAA and the relocation of all but 26 F-16s currently stationed at Luke AFB would result in an overall increase in airfield operations compared to current levels, but F-35A aircraft would operate in an airfield environment similar to the current operational environment. Since the F-35A is a new airframe and would require response actions specific to the aircraft, the emergency and mishap response plans should be updated to include procedures and response actions necessary to address a mishap involving the F-35A and associated equipment. With this update, the Luke AFB airfield safety conditions would be similar to existing conditions. Therefore, no significant impact would occur from aircraft mishaps or mishap response.

Capability for fire response is located on base and in the impacted communities. The base fire department is party to mutual aid support agreements with the nearby communities. These functions would continue to occur as they have under current conditions.

Proposed construction, renovation, and infrastructure-improvement projects related to the F-35A aircraft scenarios would be consistent with established APZs. Therefore, construction activity and subsequent operations within new or renovated structures would not result in any greater safety risk, and no significant impact related to APZs would occur.

Explosives Safety

The proposed project area does not fall within an established Q-D arc, and proposed construction, renovation, and infrastructure-improvement projects related to the F-35A aircraft scenarios would be consistent with established Q-D arcs. Therefore, construction activity and subsequent operations would not result in any greater safety risk.

Luke AFB controls, maintains, and stores all ordnance and munitions required for mission performance in accordance with Air Force and DDESB safety procedures. Munitions used by the F-35A would be similar to those associated with current aircraft based at Luke AFB. Ordnance is handled and stored in accordance with Air Force and DDESB explosives safety directives, and all munitions handling is carried out by trained, qualified personnel. The Air Force imposes procedures for arming and de-arming munitions and ordnance. All such activities occur on defined arm/de-arm pads. An arm/de-arm pad is located at specified distances away from incompatible land uses for safety standards compliance. The Air Force and DDESB procedures require safeguards on weapons systems and ordnance that ensure against inadvertent releases. Therefore, munitions handling would not result in any greater safety risk, and no significant impact related to explosives safety would occur. Laser training would use approved targets on BMGR ranges, and such training would be essentially the same as existing laser training. Therefore, F-35A laser training would not result in any greater safety risk, and no significant impact related to laser training safety would occur.

LU 3.4.2 Airspace

LU 3.4.2.1 Airspace Affected Environment

As previously stated, the primary public concern with regard to flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of weather-related accidents, mechanical failure, pilot error, mid-air collisions, collisions with manmade structures or terrain, or bird–aircraft collisions. Flight risks apply to all aircraft; they are not limited to the military.

It is impossible to predict the precise location of an aircraft accident, should one occur. Major considerations in any accident are loss of life and damage to property. The aircrew's ability to exit from a malfunctioning aircraft is dependent on the type of malfunction encountered. The probability of an aircraft crashing into a populated area is extremely low, but it cannot be totally discounted. Several factors are relevant to the airspace utilized by aircraft based at Luke AFB: pilots of aircraft are instructed to avoid direct overflight of population centers at very low altitudes; and the limited amount of time the aircraft is over any specific geographic area limits the probability that impact of a disabled aircraft in a populated area would occur.

Secondary effects of an aircraft crash include the potential for fire or environmental contamination. Again, because the extent of these secondary effects is situationally dependent, they are difficult to quantify. A crash of any aircraft can cause damage and loss of life. The terrain overflown in the ROI is diverse. For example, should a mishap occur in highly vegetated areas during a hot, dry summer, such a mishap would have a higher risk of extensive fires than would a mishap in more barren and rocky areas during the winter. When an aircraft crashes, it may release hydrocarbons. The petroleum, oils, and lubricants not consumed in a fire could contaminate soil and water. The potential for contamination is dependent on several factors. The porosity of the surface soils will determine how rapidly contaminants are absorbed. The specific geologic structure in the region will determine the extent and direction of the contamination plume. The locations and characteristics of surface water and groundwater in the area will also affect the extent of contamination of those resources.

The F-35A has not yet accumulated enough flying hours to calculate a Class A mishap rate. Table LU 3.4–1 reflects the cumulative annual Class A mishap rates of the F-15, F-16, and F-22 for the periods for which accident records have been established. The F-15 is included because it was previously based at Luke AFB and also represents an aircraft comparable in use and size to the F-35A. The F-22 has had six Class A mishaps in 7 years of testing and operations, primarily during test or weapons evaluation activities with one loss of life.

Table LU 3.4–1. Class A Accident History

Aircraft	***Reporting Period***	***Accident Rate per 100,000 Hours***	***Lifetime Hours Flown***
F-15	CY72–FY09	2.42	5,783,436
F-16	CY75–FY09	3.68	9,217,670
F-22[1]	FY02–FY09	8.59	69,844

[1] Based on actual hours; the F-22 has not reached 100,000 flight hours as of the date of this publication.
Source: AFSC 2010a.

The F-22 is expected to eventually have an accident rate of 2–3 per 100,000 flight hours. This is part of a trend. Combat aircraft are becoming more reliable, even as they become more complex. For example, in the early 1950s, the F-89 fighter had 383 accidents per 100,000 flying hours. A decade later, the rate was in the 20s for a new generation of aircraft. At the time, the F-4, which served into the 1990s, had a rate of fewer than 5 accidents per 100,000 hours. As the F-35A aircraft becomes more operationally mature and the pilots who fly it and the technicians who maintain it gain more experience, mishap rates are expected to decrease and maintain a relatively constant level. The F-35A Class A mishap rate is expected to approach that of the F-15 and F-16 over time.

A Class A mishap can also result in metal debris on the ground. The extent of the debris field depends upon the aircraft accident. Both for reconstructing the cause of the accident and for restoring the accident site as much as possible, the Air Force makes every effort to locate, document, and then clean up debris resulting from the accident.

Luke AFB maintains detailed emergency and mishap response plans to react to an aircraft accident, should one occur. These plans assign agency responsibilities and prescribe functional activities necessary to react to major mishaps, whether on or off base. Response would normally occur in two phases.

The initial response focuses on rescue, evacuation, fire suppression, safety, elimination of explosive devices, ensuring security of the area, and other actions immediately necessary to prevent loss of life or further property damage. Subsequently, the second, or investigation phase, is accomplished.

The initial response element consists of those personnel and agencies primarily responsible to initiate the first phase. This element will include the fire chief, who will normally be the first on-scene commander; fire fighting and crash rescue personnel; medical personnel; security police; and crash recovery personnel. A subsequent response team will comprise an array of organizations whose participation will be governed by the circumstances associated with the mishap and actions required to be performed.

The Air Force has no specific rights or jurisdiction just because a military aircraft is involved. Regardless of the agency initially responding to the accident, efforts are directed at stabilizing the situation and minimizing further damage. If the accident has occurred on non-Federal property, a National Defense Area will normally be established around the accident scene, and the site will be secured for the investigation phase.

After all required actions on the site are complete, the aircraft will be removed and the site cleaned up. Depending on the extent of damage resulting from a Class A mishap, only the largest damaged parts may be located and removed from a crash site.

The F-35A is capable of dumping fuel in emergency situations. The FAA sets requirements for when and how fuel dumping may occur. This instruction stipulates that fuel can only be dumped above a minimum altitude of 2,000 feet to improve its evaporation, and that a dumping aircraft must be separated from other air traffic by at least 5 miles. Air traffic controllers are also instructed to direct planes dumping fuel away from populated areas and over large bodies of water as much as possible. The same guidelines apply to military aircraft; air bases only permit fuel dumping in a specified area (FAA 2010c).

The wake turbulence behind the aircraft makes most of the fuel released vaporize into a fine mist, which remains in the atmosphere until being broken down by the sun’s energy into carbon dioxide and water. Studies of the behavior of dumped fuels have been conducted using kerosene, of which the Jet Propellant-8 fuel that powers the F-35A is a derivative (FAA 2009). Only a minimal amount of the dumped kerosene actually reaches the ground. If a fuel dump is made at the minimum altitude of 4,921 feet, given a ground temperature of 59 °F and assuming that the air is still, it is calculated that 8 percent of the total fuel dumped will reach the ground. Assuming the aircraft is flying at the minimum speed of 300 miles per hour, this results in the ground being affected by 2.09 ounces of kerosene spread over an area of 1,000 cubic yards (FAA 2009).

The above assumes total stillness of the air, which is highly unlikely. Even the slightest air movements make fuel evaporate almost entirely before it can reach the ground. In 2001, the EPA National Vehicle and Fuel Emissions Laboratory concluded, “Since fuel dumping is a rare event, and the fuel would likely be dispersed over a very large area, we believe its impact to the environment would not be serious” (EPA 2001).

Bird/Wildlife–Aircraft Strike Hazard (BASH). Bird activity and bird watch condition changes and procedures are established in the Luke AFB Bird Aircraft Strike Hazard Reduction Plan (56th Fighter Wing, Luke AFB 2005): 56 FW OPLAN 91-2 (*Bird Aircraft Strike Hazard Reduction Plan*).

Bird–aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local human populations if an aircraft crash occurs in a populated area. Aircraft may encounter birds at altitudes of 30,000 feet MSL or higher. However, most birds fly close to the ground. Over 97 percent of reported bird strikes occur below 3,000 feet AGL. Approximately 30 percent of bird strikes happen in the airfield environment, and almost 55 percent occur during low-altitude flight training (AFSC 2010b).

Migratory waterfowl (e.g., ducks, geese, and swans) are the most hazardous birds to low-flying aircraft because of their size and their propensity for migrating in large flocks at a variety of elevations and times of day. Waterfowl vary considerably in size, from 1 to 2 pounds for ducks, 5 to 8 pounds for geese, and up to 20 pounds for most swans. There are two normal migratory seasons, fall and spring. Waterfowl are usually only a hazard during migratory seasons. These birds typically migrate at night and generally fly between 1,500 and 3,000 feet AGL during the fall migration and from 1,000 to 3,000 feet AGL during the spring migration.

Along with waterfowl, raptors, shorebirds, gulls, herons, songbirds, and other birds also pose a wildlife strike hazard. The results of bird–aircraft strikes show that strikes involving raptors result in the majority of Class A and Class B mishaps related to bird–aircraft strikes (AFSC 2010b). Soaring birds of greatest concern in the airspace are vultures and red-tailed hawks. Peak migration periods for raptors are from October to mid-December and from mid-January to the beginning of March. In general, flights above 1,500 feet AGL would be above most soaring raptors. Songbirds are small birds, usually less than 1 pound. During nocturnal migration periods, they navigate along major rivers, typically between 500 to 3,000 feet AGL. The potential for bird–aircraft strikes is greatest in areas used as migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands).

While any bird–aircraft strike has the potential to be serious, many result in little or no damage to the aircraft, and only a minute portion result in a Class A mishap. During FY1985 to FY2009, the Air Force BASH Team documented 86,189 bird strikes worldwide. Of these, 32 resulted in Class A mishaps in which the aircraft was destroyed. These occurrences constituted approximately 0.04 percent of all reported bird–aircraft strikes (AFSC 2010b). For comparison, aircraft based at Luke AFB experienced no Class A or B BASH-related incidents in FY2009 or through the first quarter of FY2010 (latest data available).

Auxiliary Airfields

Aux-1. Student pilots from Luke AFB utilize Aux-1, located about 15 miles northwest of the base, for instrument approach training.

The Tactical Air Navigation approach is a nonprecision approach in which the pilot receives course guidance on the flight track from the navigation equipment but no glide path guidance.

The Instrument Landing System approach is a precision approach with both course and glide path guidance from the navigation equipment.

Although nearly 19,000 operations occur annually at Aux-1, the operations occur primarily during certain periods of time. In the Basic Course for new F-16 pilots, which typically covers a period of 7 months, the use of Aux-1 for instrument approaches occurs for a period of approximately 2 weeks during the second month of the course. There are relatively few operations at Aux-1 until the next Basic Course begins. As there typically is a new course starting every 6 weeks, there are 16 weeks of the year when high levels of operations occur at Aux-1.

Because Aux-1 does not have an active runway (aircraft do not actually land at or take off from the airfield), standard AICUZ guidance with respect to the establishment of CZs and APZs does not apply. However, aircraft using Aux-1 follow specified approach and departure patterns. They also fly low on approach to the field, coming within 150 to 300 feet of the surface and have extremely limited maneuverability during approach and departure. A JLUS produced by the State of Arizona recommended applying the Air Force APZ criteria to Aux-1. Therefore, APZs and CZs were established at both ends of the Aux-1 runway with dimensions equivalent to the AICUZ guidelines (ADC 2005). Additionally, the requirements regarding the High Noise Zone or APZ, defined by ARS 28-8461, Section 8(a), would apply to Aux-1. Additionally, the requirements regarding the High Noise Zone or APZ, defined by ARS 28-8461, Section 8(a) (Arizona 2007), would apply to Aux-1.

Gila Bend AFAF. Gila Bend AFAF is 50 miles south of Luke AFB and approximately 3 miles south of Gila Bend off of State Route 85 in Arizona. Its geographic coordinates are 32° 53′ north and 112° 43′ west. The airfield elevation is 883 feet MSL. The 8,500-foot runway is oriented 170°/350°. Gila Bend AFAF provides an alternative landing field for aircraft on the BMGR that experience inflight emergencies or have hung ordnance that precludes their flying over populated areas. Gila Bend AFAF provides all range operations and maintenance support for airspace blocks R-2301E, R-2304, and R-2305. The ranges with associated airspace extend south to the Mexican border, west to the outskirts of Yuma, Arizona, and southeast to near Tucson, Arizona. The primary aircraft operating at the airfield are F-16, AV-8, FA/18, C-130, and A-10 aircraft, as well as AH-64, AH-1F, OH-58, CH-47, and UH-60 helicopters associated with Air Force, USMC, and Army training exercises. Operations associated with the F-16 consist of simulated flameout and other visual approach training. Operations associated with the A-10, used by Davis-Monthan AFB squadrons, include visual approach training. Rotary-wing aircraft, primarily associated with the Western Area Army National Guard located in Marana, Arizona, utilize Gila Bend AFAF as a forward operating base when operating on the BMGR North and East TAC Ranges. Other training conducted at Gila Bend AFAF includes night-vision device-assisted landings and USMC weapons tactics instructor exercises, including noncombatant evacuation operations.

In addition, Gila Bend AFAF provides an important training site for simulating the operating conditions of a forward-operating base. Forward-operating bases are established to launch tactical operations in strategic locations often in combat zones, such as those encountered in Iraq or Afghanistan. Air Force squadrons and other DoD units are deployed to Gila Bend AFAF to familiarize them with forward-operating base conditions prior to overseas deployments for

war-fighting or peace keeping missions. Fighter squadrons or other tactical aviation units deployed to Gila Bend AFAF for forward-operating base training use the airfield to generate training sorties on BMGR East similar to those encountered when deployed overseas.

Gila Bend AFAF houses support facilities for the control, maintenance, and security of the BMGR and ATC, fire department, and flightline services for the airfield. The airfield hosts the BMGR Security office and billeting for visiting personnel working temporarily on the BMGR. Existing operation levels for all aircraft using the facilities at Gila Bend AFAF total 9,641 annual operations.

LU 3.4.2.2 Airspace Environmental Consequences

Aircraft Mishaps. The potential beddown of up to 144 F-35A PAA and the relocation of all but 26 F-16s currently stationed at Luke AFB would result in F-35A operations similar to those currently ongoing at Luke AFB. The F-35A would use the existing airspace, including MOAs, ATCAAs, restricted airspace, MTRs, and low-level routes under the same procedures as currently exist. This would not result in any increase in the safety risks associated with aircraft mishaps or any increase in the risks of occurrence of those mishaps.

Flare Use. As described in Chapter 2, Section 2.4.5, and in Section LU 2.2.2, the F-35A would use MJU-61/B defensive flares. These flares are similar to the flare types used by legacy aircraft such as the F-16s. Flares would only be used in airspace units approved for flare use and within authorized altitudes. For Luke AFB, flares are authorized in the R-2301E and R-2304/R-2305 with release altitudes ranging between 300 feet AGL and 1,000 feet AGL for the portion of the airspace of government-owned or government-controlled land depending on fire danger and the types of flares being used. For the portion of R-2301E over the Cabeza Prieta NWR, the minimum release altitude for flares is 1,500 feet AGL. Flares are also authorized in the Sells MOA/ATCAA with minimum release altitude of 3,000 feet AGL and in the Gladden MOA/ATCAA and Bagdad MOA/ATCAA with minimum release altitudes of 5,000 feet AGL or 7,000 feet MSL, whichever is higher. Flares typically burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flare burnout before a flare reaches the ground or water under the training airspace. Luke AFB, which manages the airspace, would also have the discretion to restrict flare use during high or extreme fire danger to minimize the risk of wildland fires. Air Force Instructions (AFIs) are issued for each base to establish restrictions on flare deployment. Typically, these AFIs designate airspace managers or range controllers with the responsibility to identify and publicize fire conditions and specify minimum altitudes for flare use. Fire category restrictions are established for the use of flares, and aircrews are responsible to know the fire code and associated restrictions. Aircrews are briefed on fire conditions prior to a mission, and, if in doubt, the AFIs specifically state an "aircrew will not dispense flares anywhere in the impact area or MOA without positive confirmation that flare use is authorized." Airspace managers or range controllers apply a decision matrix that takes into consideration the fire danger assigned by the U.S. Forest Service to the forests, such as high, very high or extreme, fuel load on the ranges, recent rainfall, humidity, winds, etc. Based on fire danger conditions, use of flares in specific airspaces can change on a daily basis.

On extremely rare occasions (estimated at approximately 0.01 percent of flares dispensed), a flare may not ignite and would fall to the earth as a dud flare. In an extremely rare occasion, where a dud flare is found, it should not be moved, the location should be identified, and the Air Force base public affairs office should be contacted and provided with the dud flare location.

The residual materials for flares, including the MJU-61/B, are described in detail in Chapter 2, Section 2.4.5. All of the MJU-61/B residual flare materials that fall have surface area to weight ratios that would not produce any substantial impact when the residual flare material struck the ground. The largest item is the 0.975 inch × 0.975 inch × 0.5 inch plastic and spring igniter device with a weight of approximately 0.33 ounces in the MJU-61/B flare. This igniter device would strike the ground with a momentum of 0.046 lb-sec, or approximately the same force as a small hailstone, which would be noticed if it struck a person, but would not be expected to bruise. Additionally, the likelihood of a strike is remote given the areal extent of the airspace, the population density beneath the airspace, and the proportion of time a person is expected to be outside. Therefore, no significant impacts on safety from flare residual materials are expected.

BASH. A BASH exists at Luke AFB and its vicinity due to resident and migratory bird species and other wildlife. Many Canada geese and cormorants spend the winter in the Phoenix area, including in the vicinity of Luke AFB. Golf courses and agricultural areas to the north (Surprise) and south (Goodyear, Avondale) host thousands of medium- and large-bodied waterfowl each winter. The likelihood for waterfowl–aircraft collisions is not only high during fall and spring migration, but throughout the winter as well. During the winter, Canada geese and cormorants have separate roosting and foraging areas in the Luke AFB region. As a result, these large-bodied birds fly between their roosting and foraging areas each morning and afternoon. This means the BASH risk posed by waterfowl may be expected to increase during early to mid-morning and mid- to late afternoon. These daily and seasonal bird movements create various hazardous conditions. To address the issues of bird–aircraft strikes, the Air Force has developed the Avian Hazard Advisory System to monitor bird activity and forecast bird strike risks. Using Next Generation Radar weather radars and models developed to predict bird movement, the Avian Hazard Advisory System is an online, near real-time geographic information system (GIS) used for bird strike risk flight planning across the contiguous United States.

Additionally, as part of an overall strategy to reduce BASH risks, the Air Force has developed a Bird Avoidance Model using GIS technology as a key tool for analysis and correlation of bird habitat, migration, and breeding characteristics and is combined with key environmental and manmade geospatial data. The model was created to provide Air Force pilots and flight schedulers/planners with a tool for making informed decisions when selecting flight routes. The model was created in an effort to protect human lives, wildlife, and equipment during air operations. This information is integrated into required pilot briefings, which take place prior to any sortie.

56 FW has an ongoing BASH program. Since future aircraft flight operations will remain similar to those currently experienced at Luke AFB, the overall potential for bird/wildlife–aircraft strikes is not anticipated to be significantly greater than current levels. F-35A aircrews

operating in Luke AFB airspace would be required to continue the applicable procedures outlined in the Luke BASH Plan (56th Fighter Wing, Luke AFB 2005). Luke AFB personnel developed procedures designed to minimize the occurrence of bird/wildlife–aircraft strikes and have documented detailed procedures to monitor and react to heightened risk of bird strikes (Luke AFB 2007a). When BASH risks increase, limits are placed on low-altitude flight and some types of training (e.g., multiple approaches, closed-pattern work) in the airport and airspace environments. Special briefings are provided to pilots whenever the potential exists for greater bird strike sightings within the airspace. F-35A pilots would be subject to these procedures. Therefore, no significant impact would occur related to BASH issues.

Auxiliary Airfields

Aux-1 and Gila Bend AFAF are identified as the primary use auxiliary airfields for Luke AFB F-35A aircraft. Table LU 2.2–4 shows the number of airfield operations proposed at these two airfields under each aircraft scenario.

Aux-1. Aux-1 does not have an active runway; therefore, only approaches and departures are proposed for this facility. APZs and CZs have been established at Aux-1, which could address any potential issues related to aircraft accidents resulting from training operations at Aux-1.

Gila Bend AFAF. Gila Bend AFAF has adequate equipment and trained personnel to handle any potential safety issues associated with the operations of the F-35A aircraft. Therefore, no impacts on flight, ground, or explosive safety are anticipated due to utilization of Gila Bend AFAF.

LU 3.5 Soils and Water

LU 3.5.1 Base

LU 3.5.1.1 Base Affected Environment

Soils

Luke AFB is located in the central part of Maricopa County, which is characterized by broad valleys situated between north–south oriented mountain ranges. Erosion of these mountains has deposited large volumes of sand and gravel on the valley floors, resulting in relatively flat to gently sloping topography at Luke AFB. Elevations across the base range from 1,075 to 1,125 feet MSL, with a gentle slope from north to south. Two naturally occurring hills are present between Litchfield Road and the Munitions Storage Area (MSA), near the southeastern boundary of the base. Earthmoving activities associated with Luke AFB development have altered much of the soil profiles to the extent that soil horizons do not concur with local soil surveys from adjacent off-base areas.

Soils underlying Luke AFB consist primarily of loam, mixed with sands, silts, and clays. Seven soil series and one soil complex occur at Luke AFB (NRCS 2010). The predominant soil type is the Gilman series, which occurs on valley plains and low terraces, at slopes from 0 to 3 percent. The Gilman series consists of loam and sandy loam of moderately permeable soils. Other soil types include Calciorthid soils, which consist of sandy loam to clay loam, gravel, and cobble

materials, often used for fill material. The Estrella series consists of loam of slow to moderate permeability, on broad alluvial fans and low terraces, with grades of less than 1 percent. The Glenbar series consists of loam of moderate permeability, on grades less than 1 percent. The Laveen series consists of sandy loam, loam, and saline-alkali loam of moderate permeability, on grades from 0 to 3 percent. The Mohall series consists of loam and clay loam, of slow to moderate permeability, on grades less than 1 percent. The Antho series consists of permeable sandy loam. The Pinal series consists of loams of moderate permeability, deposited over a silica-lime cemented hardpan that is nearly impermeable, on grades of less than 3 percent. And the Rillito–Perryville complex consists of gravelly and sandy loams formed on remnant stream terraces and alluvial fans.

Water

Surface Water. Luke AFB is located in the Phoenix metropolitan area, which, in turn, is located within the valleys of four major rivers: the Salt, Verde, Agua Fria, and Gila Rivers. The Salt River flows through the northeast and southwest portions of the Phoenix metropolitan area, flowing in a general northeast-to-southwest direction. The Verde River is located to the east and flows to the Salt River just north of the city of Mesa. The Agua Fria River is located in the western portion of the Phoenix area and flows to the Gila River, which runs through the southern end of the city of Avondale. The Gila River, running in a southwesterly direction, flows through the southern portions of the Phoenix metropolitan area and is the final destination for all the water originating in and passing through Maricopa County (Chronic 1983; FCDMC 2006).

Luke AFB is located within the Lower Salt River Basin of the Agua Fria watershed. Within this basin, Luke AFB lies within the western portion of the Salt River Valley (EPA 2006). No perennial or ephemeral streams, natural lakes, or other open bodies of water, except for manmade impoundments, are found on Luke AFB, primarily because it is highly developed. Manmade canals direct surface-water flows and control erosion on Luke AFB. The canals are located on the northern, southern, and western edges of the airfield. Local thunderstorms are intense enough at times to cause flash flooding; however, most precipitation is lost through evaporation. The area around Luke AFB is also highly developed and most natural drainage features have been altered, with the exception of the Agua Fria River and New River, located approximately 1.5 miles east of the base. The Agua Fria River is the receiving stream for surface-water runoff from the northern portion of Luke AFB. The southern portion of the base drains to Bullard Wash, which flows into the Gila River (Luke AFB 2002, 2004). No jurisdictional wetlands have been identified on Luke AFB (USACE 1994).

Floodplains. The Federal Emergency Management Agency (FEMA) is responsible for evaluating flood control improvements and issuing floodplain zone designations. The 100-year floodplains have been identified along all four major river systems that traverse the Phoenix metropolitan area, including the Salt, Gila, Agua Fria, and Verde Rivers. The boundaries of the delineated floodplains vary along the river channels depending on topography, soils and vegetation, the size of the watershed, and the condition of the channel (FCDMC 2006).

Prior to 2000, FEMA included a majority of Luke AFB within a 100-year floodplain. In 1997, the Dysart Drain, located along the northern boundary of the base, was rebuilt. In addition, a

detention basin was constructed in the northwestern portion of the base to alleviate flooding problems caused by ground subsidence at Luke AFB and surrounding areas. Construction of the detention basin and reconstruction of the drain resulted in removal of much of Luke AFB from the 100-year floodplain. The current FEMA Flood Insurance Rate Map is dated September 30, 2005 (FEMA 2005) (see Figure LU 3.5–1).

Groundwater. Groundwater includes the subsurface hydrologic resources of the physical environment and is predominantly a safe and reliable source of fresh water for the general population, especially those in areas of limited precipitation. Groundwater is commonly used for potable water consumption, agricultural irrigation, and industrial applications. Groundwater also plays an important part in the overall hydrologic cycle, and its properties are described in terms of depth to aquifer or water table, water quality, and surrounding geologic composition.

A primary source of water in Maricopa County is groundwater. Underground reserves are supplemented by natural river flows, impounded diversions, treated sewage effluent, and groundwater imported via canals. An important concern in the region is the rapid depletion of groundwater reserves, which has taken place in areas surrounding Luke AFB. Testing of groundwater wells shows that water levels in these areas have declined from 300 to over 550 feet below ground surface in the past 60 years, resulting in compaction of the aquifer system. This compaction has created large areas of land subsidence and earth fissures (Luke AFB 2002). However, due to the rapid transition of agriculture land to urban development in the last 7 years, groundwater levels are currently rising.

LU 3.5.1.2 Base Environmental Consequences

Soils and Surface Water. Depending on the F-35A aircraft scenario chosen for Luke AFB, construction would disturb a maximum of approximately 31.2 acres of land, most of which has been previously disturbed. Removal of existing pavement, grading, and excavations would expose soil to potential wind and water erosion, which, in turn, could result in sedimentation of nearby drainages and creeks.

Because more than 1 acre would be disturbed by construction, an Arizona Pollutant Discharge Elimination System (AZPDES) storm water permit would be required. Under the permit, Luke AFB must develop a construction Storm Water Pollution Prevention Plan (SWPPP) that describes BMPs to be implemented to eliminate or reduce sediment and non-storm-water discharges.

Surface erosion is best controlled by stabilization practices, such as seeding, mulching, surface roughing, and buffer strips, as well as minimizing the disturbed area and the time of exposure to disturbance. In addition, erosion can be controlled by structural actions such as construction of silt fences and straw bales, check dams, sediment traps, compost filter berms, and stabilized entrance and exit points to construction sites. With proper design and implementation of the SWPPP, impacts from erosion and offsite sedimentation would be negligible and significant impacts would not occur.

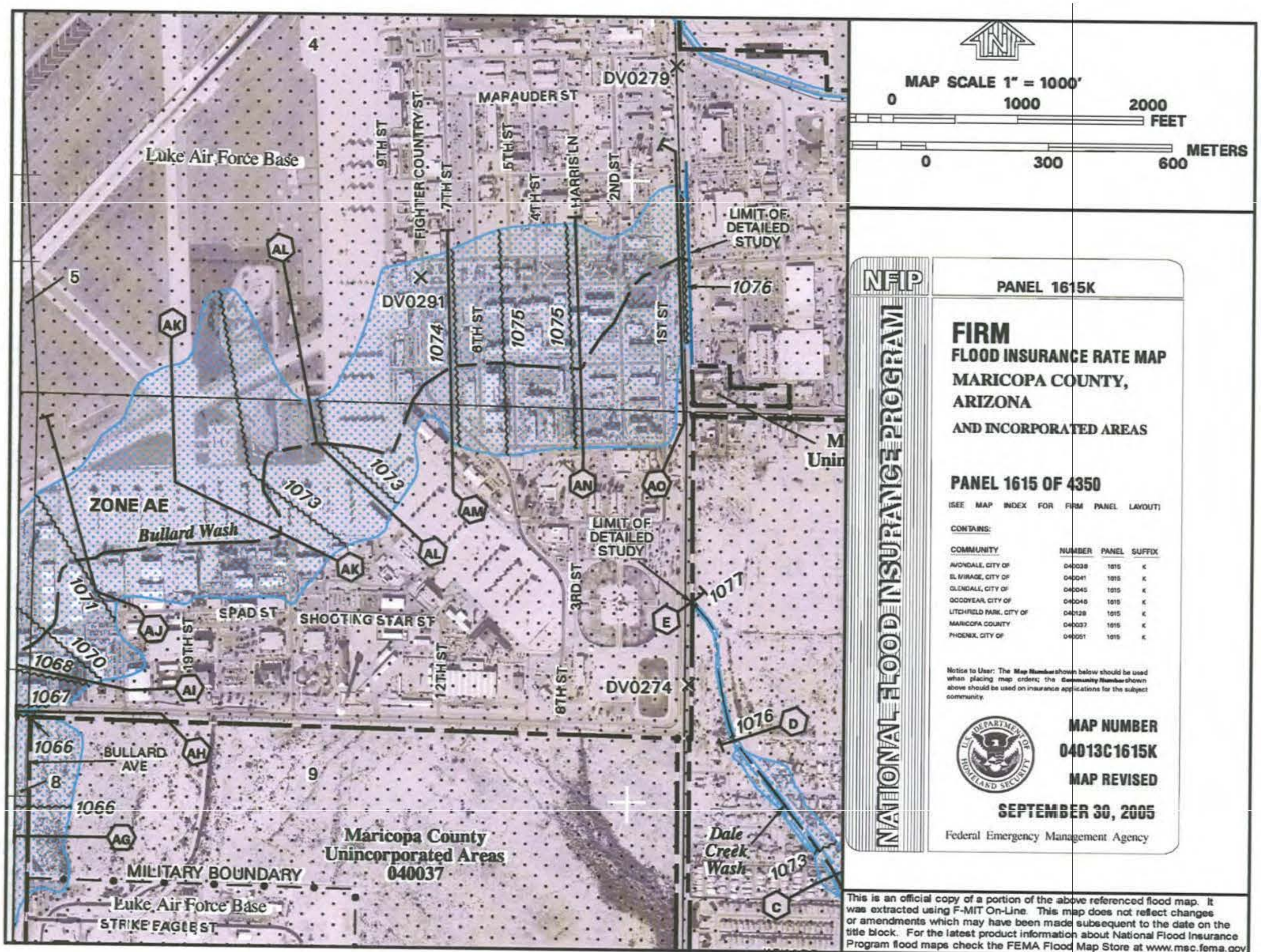


Figure LU 3.5–1. Luke AFB Federal Emergency Management Agency Flood Insurance Rate Map

The main limitation of the Pinal soils, with respect to construction, is the depth to hardpan (i.e., caliche). Heavy machinery would be required for leveling or making shallow excavations for utilities. However, these soil limitations can be mitigated through standard engineering and modern construction techniques, such that significant impacts would not occur.

Floodplains. Most construction would take place within the floodplain on previously disturbed sites. Storm drainage would be part of site development, and finished floor elevations would be a minimum of 1 foot above the 100-year floodplain. Findings of No Practicable Alternative would be sought on each project, where required.

Groundwater. The implementation of any of the F-35A aircraft scenarios would not include the direct use of groundwater withdrawals and would not directly affect the groundwater resources.

LU 3.5.2 Airspace

LU 3.5.2.1 Airspace Affected Environment

The land beneath the training airspace is characterized by localized steep rocky slopes that are susceptible to rockfalls, which occur most frequently during early spring, when there is abundant moisture and repeated freezing and thawing. The rocks may freefall, slide, or tumble down slopes in an erratic manner. When a large number of rocks plummet downward at high velocity, it is called a rock avalanche. Rockfalls are caused by the loss of support from underneath or detachment from a larger rock mass. Ice wedging, root growth, or ground shaking, as well as a loss of support through erosion or chemical weathering, may start the fall. However, man's activities can also cause rocks to fall sooner than would occur naturally. Excavations into hills and mountainsides for highways and buildings frequently aggravate rockfalls. Other causes include vibration from passing trains, blasting, changes in groundwater conditions, and sonic booms (Colorado Geological Survey 2010).

LU 3.5.2.2 Airspace Environmental Consequences

Water Quality. F-35A pilots would not train with chaff. However, flares would be used as part of the Proposed Action, as described in Chapter 2, Section 2.4.5, Ordnance and Defensive Countermeasures. Each defensive flare consists of small pellets of highly flammable material that burn rapidly at extremely high temperatures. Flares provide a heat source, other than the aircraft's engine exhaust, to decoy heat-sensitive or heat-seeking targeting systems. The flare ignites upon ejection from the aircraft and burns completely within approximately 3.5 to 5 seconds, or approximately 400 to 500 feet from its release point (Air Force 1997a).

Toxicology studies on flare residual materials indicate that no chemical effects are expected for water resources, since the primary material in flares, magnesium, is not highly toxic. Pieces of plastic, Mylar, and/or paper fall to the earth with each bundle of flare deployed. Such materials are inert and are not likely to adversely impact water quality. The probability of a dud flare hitting the ground is extremely low, at an estimated rate of 0.01 percent of flares deployed. In the unlikely event that an intact dud flare lands in a water body, such as a wetland, creek, pond, or lake, there would be minimal to no effects of the metallic magnesium from the flare on the water body. Magnesium is already a substantial natural component of the earth, and the

amount from a flare would be comparably insignificant (Air Force 1997a). Due to the low concentrations of the flare residue and the low probability of flare residue coming in contact with water bodies, flare releases are not expected to cause significant water quality impacts.

Soils. Lichens and cyanobacteria are important components of soil crust communities in the intermountain western United States, especially in areas protected from domestic grazing, wildfire, and off-road vehicle activity. Their presence is critical for soil stability, as well as for the contribution of nitrogen to the ecosystem in a form available to higher plants. Soil crusts in general, and lichens and cyanobacteria in particular, tend to be very sensitive to human-related perturbation, including air pollution (St. Clair et al. 1993; Belnap et al. 2001). The Proposed Action would have a large carbon footprint, and the increased pollution could affect soil crusts, which play a key role in retaining soil moisture and reducing water loss. Such soil crust impacts would be unavoidable.

Rockfalls. Although not common, sonic booms can potentially cause rockfalls to occur in localized areas of steep rocky slopes. Rockfalls are potentially dangerous in areas where people and/or property reside immediately downslope. Such failures would occur along slopes that are already susceptible to failure by other natural and/or manmade factors, as previously described. Typically, slopes prone to rockfalls in developed areas, such as along highway road cuts, have been engineered with protective devices, including wire netting and impact walls. As a result, slope failure reactivation by sonic booms would not be outside the norm for any given slope, such that significant impacts would not occur.

No other ground disturbance would occur in association with airspace operations; therefore, no additional impacts would occur with respect to soil and water.

LU 3.6 Vegetation and Wildlife

LU 3.6.1 Base

LU 3.6.1.1 Base Affected Environment

Vegetation

Luke AFB is situated in the Lower Colorado River Valley subdivision of the Sonoran Desert (Brown and Lowe 1980). This ecological subdivision includes most arid portions of the Sonoran Desert and typically occupies broad, intermontane plains on alluvial soils, although it is not restricted to this physical setting. Vegetation is generally sparse, often with many hundreds of square miles dominated by one or two species of low-growing shrubs. The ground surface between shrubs may be fine-textured soil or desert pavements consisting of gravel or rock. Plants are drought-resistant, with morphological adaptations to retard transpiration such as leaf hairs, succulent foliage, and light coloration. Creosotebush (*Larrea tridentata*) is the dominant plant species in this vegetation type and typically forms stands of uniform growth on the flat intermontane plains, broken by intermittent washes that support palo verdes (*Parkinsonia* spp.) and mesquites (*Prosopis* spp.) along their margins.

The vegetation present on Luke AFB consists primarily of ruderal species and landscaped areas replanted after development of airport facilities, roads, parking, and residential areas. Native vegetation has almost entirely been disturbed from its natural condition, with small areas of desertscrub and woodlands remaining in the southern portion of Luke AFB.

Desertscrub remnants on Luke AFB include general dominance of desert saltbush (*Atriplex polycarpa*) with local areas of Creosotebush-Bursage Series (Air Force 2006b). In contrast to the main airfield and other developed areas, the area around the munitions compound to the southeast of the main field is composed of mostly native vegetation. The uplands are dominated by a sparse growth of creosotebush with other shrub species interspersed. The drainages are dominated by large shrubs, primarily mesquite and palo verde. Much of the area to the north and west is lower in elevation and patterned by a network of shallow drainages. Desert saltbush dominates low-lying, interwash lands throughout this area.

Desert woodlands occur along drainages and are characterized by the dominance of large shrubs and small trees that provide refuge for a number of wildlife species. Natural drainages at Luke AFB are generally dominated by velvet mesquite (*Prosopis velutina*) and blue palo verde (*Parkinsonia floridum*), whereas altered or created drainages support desert broom (*Baccharis sarothroides*).

The remainder of Luke AFB is primarily composed of disturbed sites that are characterized by no vegetation or weedy, annual species. These may be divided into mesic (e.g., ditches) and xeric (e.g., the remainder of the area) sites, which affect vegetation present. Disturbed areas dominate adjacent to the runway, where Bermuda grass (*Cynodon dactylon*) and other invasive grasses and forbs are mowed.

The area surrounding the main airfield is also disturbed regularly by heavy traffic and use and is mowed on a regular basis. One of the common, native, perennial grasses that persist around the airfield is alkali sacaton (*Sporobolus airoides*), which thrives under repeated mowing. Other plants that occur in this area include several winter and spring annuals, such as comb bur (*Pectocarya heterocarpa*), fiddlenecks (*Amsinckia* spp.), little mallows (Malvaceae), plantains (*Plantago* spp.), mustards (Brassicaceae), popcorn flowers (*Cryptantha* spp.), and filarees (*Erodium* spp.), as well as introduced and native grasses. Plants likely to be present following onset of the summer rainy season include camphorweed (*Heterotheca subaxillaris*), spiderling (*Boerhavia* spp.), wooly tidestromia (*Tidestromia lanuginosa*), six-weeks grama (*Bouteloua barbata*), horseweed (*Conyza canadensis*), Russian thistle (*Salsola iberica*), silverleaf nightshade (*Solanum elaeagnifolium*), and other native and nonnative species. Perennial forbs that persist on the site likely include globe mallows (*Sphaeralcea* spp.) and desert straw (*Stephanomeria pauciflora*).

The landscaped vegetation on Luke AFB consists of mixed plantings of introduced and native species. Landscape vegetation is found around buildings where irrigation supports introduced cactus, succulents, and other species. Luke AFB maintains and develops its landscaped areas using a Landscape Design and Maintenance Standards Plan, available in the Integrated Natural Resources Management Plan (INRMP) (Air Force 2006b). This plan is the commitment of Luke AFB to create a more-natural environment within its perimeter. The landscape design promotes xeriscaping (drought-tolerant plantings) and limits the amount of turf and nonnative plant species. The golf course landscaping is focused on low-water-use native plants, which

translates to about 30 acres of xeriscaping. Only the greens, tee boxes, fairways, and parts of the rough are maintained as turf.

Wildlife

The landscaped vegetation present on Luke AFB may supply food and cover for small animal species common to central Arizona that are habituated to human presence and disturbed areas. Species such as striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor mexicanus*), collared peccary or javelina (*Pecari tajacu*), coyote (*Canis latrans*), and desert cottontail (*Sylvilagus audubonii*) typically occur in urban areas of this region. Often scavengers and generalists, these species take advantage of cover and food sources humans inadvertently provide by landscaping or waste (e.g., trash cans, landfills). Wildlife present in more-remote areas of Luke AFB is characteristic of the Lower Colorado River Valley subdivision of the Sonoran Desert (Turner and Brown 1982). Small, nocturnal, burrowing rodents such as pocket mice (*Chaetodipus* spp.) and kangaroo rats (*Dipodomys* spp.), bats, and diurnal, burrowing species (e.g., round-tailed ground squirrel) are the most common mammals present in areas that retain some elements of natural habitat characteristics (Air Force 2006b). With the possible exception of foraging and/or roosting bats, these characteristic, native species are less likely to occur in significant numbers in the developed and landscaped areas of the base. Other mammals likely to occur in relatively intact native habitats include black-tailed jackrabbit (*Lepus californicus*) and kit fox (*Vulpes macrotis*). Some species, particularly the desert cottontail and coyote, may utilize landscaped areas such as golf course greens.

The U.S. Army Corps of Engineers (1994) reported the most common birds at Luke AFB during their surveys as the mourning dove (*Zenaida macroura*), horned lark (*Eremophila alpestris*), European starling (*Sturnus vulgaris*), great-tailed grackle (*Quiscalus mexicanus*), northern mockingbird (*Mimus polyglottos*), and house finch (*Carpodacus mexicanus*), many of which are associated with human habitation and landscaped areas. Also common are the house sparrow (*Passer domesticus*) and cliff swallow (*Petrochelidon pyrrhonota*), a colonial breeder on Luke AFB. Horned larks are most common in the open, mowed fields surrounding the base runways. Other birds noted on base include the red-tailed hawk (*B. jamaicensis*), Swainson's hawk (*Buteo swainsoni*), turkey vulture (*Cathartes aura*), greater roadrunner (*Geococcyx californianus*), violet-green swallow (*Tachycineta thalassina*), barn swallow (*Hirundo rustica*), northern rough-winged swallow (*Stelgidopteryx serripennis*), white-crowned sparrow (*Zonotrichia leucophrys*), cactus wren (*Campylorhynchus brunneicapillus*), loggerhead shrike (*Lanius ludovicianus*), song sparrow (*Melospiza melodia*), Say's phoebe (*Sayornis saya*), and western meadowlark (*Sturnella neglecta*) (Air Force 2006b). Reptiles and amphibians likely to occur in the Luke AFB vicinity include such common, widespread species as the side-blotched lizard (*Uta stansburiana*), western whiptail lizard (*Cnemidophorus tigris*), gopher snake (*Pituophis catenifer*), great plains toad (*Bufo cognatus*), and Couch's spadefoot toad (*Scaphiopus couchii*), the amphibians largely dependent on the presence of water for breeding. Large ungulates are typically absent from Luke AFB due to a perimeter fence, and carnivores that do occur are typically small and nocturnal. An inventory of vertebrate and plant species likely to occur and actually observed at Luke AFB is presented in the INRMP (Air Force 2006b).

LU 3.6.1.2 Base Environmental Consequences

Construction

For the beddown of F-35A aircraft at Luke AFB, a minimum of approximately 21.1 acres under Scenario L1 (addition of 24 aircraft) and a maximum of 31.2 acres under Scenario L6 (addition of 144 aircraft) of land would be disturbed for construction of facilities needed to support F-35A training on Luke AFB. Construction would occur within previously disturbed portions of the base near other development. Construction activities may include demolition and renovation of existing structures and infrastructure improvements on the base. For all land disturbance calculations, 10 percent was added outside of the project footprints to account for temporary land disturbance likely to occur for equipment access and laydown areas.

For construction and demolition activities in developed portions of Luke AFB, no long-term effects on vegetation and wildlife are anticipated. During demolition and construction activities on Luke AFB, the amount of noise and dust generated is expected to increase during working hours, although normal precautions would be taken to minimize these effects (see Sections LU 3.2, Noise, and LU 3.3, Air Quality). Additionally, measures to control erosion and siltation would be included as part of the project to minimize the potential for continued erosion and dust generation and decrease the duration of temporary habitat loss. To comply with the Migratory Bird Treaty Act and the DoD Bat Protection Memorandum of Understanding and to assume no habitation by nesting birds or sensitive bat species, abandoned buildings would be surveyed for these species before their demolition, removal, or renovation. Because areas proposed for construction on Luke AFB have already largely been disturbed, no adverse effects on vegetation or wildlife are expected.

Operations

No effects on vegetation are expected from F-35A operations in the vicinity of Luke AFB. Wildlife species on and near Luke AFB exist in an airfield environment, which includes regular takeoffs, landings, and low-level overflights by military aircraft. The F-35A aircraft would employ similar departure, closed patterns, and landing procedures as those currently used by Luke AFB aircraft. F-35A operations would adhere to existing restrictions and avoidance procedures. The noise levels associated with the F-35A aircraft vary considerably, according to the actual flight profile. Noise levels expected as a result of implementing the F-35A aircraft scenarios would be qualitatively similar to the existing noise environment. Wildlife species in the vicinity of Luke AFB live in a military airfield environment would not be expected to be adversely affected by changes in aircraft overflight and noise associated with transitioning to the F-35A aircraft.

LU 3.6.2 Airspace

LU 3.6.2.1 Airspace Affected Environment

Vegetation

The vast majority of the proposed airspace associated with Luke AFB (see Figure LU 2.2–1) extends over subdivisions of the Sonoran Desert. Established MTRs, which have alphanumeric designations starting with "VR" (visual route) or "IR" (instrument route), provide flight corridors between the larger blocks of established airspace that would be used for training (e.g., MOAs). These MTRs overlie some higher-elevation areas that support a variety of other habitat types. For example, VR-239 overlies portions of interior chaparral, conifer and evergreen woodlands, and semidesert grasslands. Table LU 3.6–1 lists the vegetation or life zones that occur under the project airspace, acreage, and percentage of the land overlain by the airspace covered by each type of vegetation of life zone.

Table LU 3.6–1. Vegetation/Habitat and Life Zones Under Luke AFB Primary Use Airspace

Vegetation/Life Zone	*Acres Under the Airspace*	*Percentage of the Total Area Under Airspace*
Lower Sonoran Zone		
Sonoran Desert		
Arizona Uplands	5,530,370	43
Lower Colorado River Valley	4,172,830	33
Mojave Desert	291,722	2
Subtotal	**9,994,922**	**78**
Upper Sonoran Zone		
Woodlands (conifer, evergreen, chaparral)	2,108,366	16
Semidesert Grasslands	618,133	5
Subtotal	**2,726,499**	**21**
Canadian Zone		
Montane Coniferous Forests	83,601	< 1
Total	**12,805,022**	**100**

Source: AZGFD 2004a.

The habitat characteristics of project MOAs are described below.

Lower Sonoran Life Zone. The Lower Sonoran Life Zone, which covers lands under approximately 9,994,922 acres (78 percent) of the ROI, is occupied by two subdivisions of the Sonoran Desert: the Lower Colorado River Valley and Arizona Uplands. The Lower Colorado River Valley is the largest and most arid subdivision of the Sonoran Desert. It occurs in low-elevation valleys and plains in southwestern Arizona. Plant growth is typically sparse. Primary plant communities include the creosotebush-white bursage, saltbush, and creosotebush-big galleta community. The Arizona Uplands subdivision of the Sonoran Desert is found on slopes, broken ground, sloping plains, and mountains, generally at higher elevations to the north and east of the Lower Colorado River Valley subdivision. The primary plant community is paloverde-cacti-mixed scrub, which contains saguaro and other cacti. The primary desert trees that occur on rocky slopes and washes include foothill palo verde (*Parkinsonia microplyllum*), ironwood (*Olneya tesota*), saguaro (*Carnegiea gigantea*), and tree-like chollas (*Cylindropuntia* spp.) (Lowe 1980; Turner and Brown 1982). Where dry washes (arroyos)

occur, other trees that take advantage of the temporary water source include blue palo verde (*Parkinsonia floridum*), mesquite (*Prosopis* spp.), catclaw (*Acacia greggii*), smoketree (*Dalea spinosa*), and desert willow (*Chilopsis linearis*). The predominant vegetation that occupies valleys, mesas, and terraces in the Lower Colorado River Valley subdivision is the creosotebush-bursage (*Larrea-Ambrosia)* community (Lowe 1980). Periodically flooded valley bottoms with fine-textured soils support salt-tolerant plants such as desert saltbush (*Atriplex polycarpa*).

Mojave Desert occurs in a transition zone between the Great Basin Desert and the Sonoran Desert in the Lower Sonoran Life Zone, primarily occurring in California (Lowe 1980). The proposed airspace overlies approximately 291,722 acres (2 percent of the ROI) of Mojave Desert under the northern MOAs. Typical vegetation communities in the Arizona portion of the Mojave Desert include creosotebush and white bursage, with the occasional Joshuatree (*Yucca brevifolia*) and Mojave yucca (*Y. schidigera*) in higher locations and catclaw acacia occurring in washes.

Airspace units that overlie the Lower Sonoran Life Zone include the Gladden, Bagdad, and Sells MOAs; BMGR (R-2301E, R-2304, and R-2305); and most of the MTRs.

Upper Sonoran Life Zone. The Upper Sonoran Life Zone occurs on lands under approximately 2,726,499 acres (21 percent) of the project airspace and includes grassland and woodland vegetation. Desert grassland communities occur as transitional landscapes between the desert and woodlands that grow at higher elevations (Lowe 1980). These grasslands survive on deeper soils protected from erosion and little competition from shrubs and cacti and support stands of bunchgrasses such as grama grasses (*Bouteloua eriopoda*, *B. gracilis*, *B. curtipedula, B. filiformis,* and *B. hirsuta*). Other grasses that can be intermixed include plains lovegrass (*Eragrostis intermedia*), plains bristlegrass (*Setaria machrostachya*), and sand dropseed (*Sporobolus cryptandrus*). Plains grasslands form a more continuous cover of grasses, including gramas, muhly (*Muhlenbergia* spp.), needlegrasses (*Stipa* spp.), dropseeds (*Sporobulus* spp.), and sprangletop (*Leptochloa* spp.). Airspace units that overlie grasslands include the Gladden and Sells MOAs and VR-239, VR-243, VR-242, and VR-241/244.

There are three primary woodland vegetation types (conifer, chaparral, and evergreen) that occur under the proposed airspace located to the south of the Gila River between 4,000 and 6,500 feet elevation. Chaparral habitat occurs in the central portion of Arizona as dense, shrubby vegetation of fairly uniform height between 3 and 7 feet (Lowe 1980). These plants include tough-leaved shrubs such as scrub oak (*Quercus turbinella*), mountain-mahogany (*Cercocarpus* spp.), manzanita (*Artostaphylos* spp.), sumac (*Rhus* spp.), and *Ceanothus* spp. In the evergreen woodland, a variety of oaks (*Quercus* spp.) are common, along with alligator juniper (*Juniperus deppeana*), one-seed juniper (*J. monosperma*), and Mexican piñon (*Pinus cembroides*). These woodland stands tend to be more open than chaparral and can have understories of grasses, shrubs, succulents, and cacti (Lowe 1980). Conifer or oak-pine woodlands occur at the elevation just below the ponderosa pine (*P. ponderosa*) forests and are characterized by the presence of Chihuahua pine (*P. leiophylla*) and Apache pine (*P. engelmannii*). Conifers from the evergreen woodlands may be intermixed. Airspace units that overlie woodlands include the Gladden, Bagdad, and Sells MOAs and VR-239, VR-241/244, VR-243, VR-242, and VR-245.

Canadian Life Zone – Montane Coniferous Forests. The Canadian Life Zone encompasses montane (mountain) forest communities that occur from about 7,500 to 9,500 feet elevation, primarily under the eastern portion of the ROI. This life zone occurs on approximately 83,601 acres (less than 1 percent) under the airspace within the ROI. Fir forest stands, consisting of predominantly Douglas fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*), are sustained on higher amounts of precipitation received primarily in the winter as snow (Lowe 1980). At higher elevations, alpine fir (*Abies lasiocarpa*) may be present. Fir forests typical of Canadian Life Zones often intermix with the ponderosa pine forests at lower elevations that tend to occupy ridges and southerly exposures (Lowe 1980). Deciduous understory trees that occur in this life zone include Gambel oak (*Quercus gambelii*), box elder (*Acer negundo*), water birch (*Betula occidentalis*), and blueberry elder (*Sambuca glauca*). Because of forest density, few ground cover plants are present. Following burns and other major disturbance, aspens may form a subclimax forest community. VR-239, VR-243, and VR-241/244 are the primary airspace units that overlie the Canadian Life Zone. Wetlands and riparian habitats are discussed in Section LU 3.7, Wetlands and Aquatic Communities.

Wildlife

Sonoran Desert wildlife species that occur under the proposed airspace units include many species of diurnal lizards and mostly nocturnal snakes and aridity-adapted bird species, such as the greater roadrunner (*Geococcyx californicus*), black-throated sparrow (*Amphispiza bilineata*), cactus wren (*Campylorhynchus brunneicapillus*), ash-throated flycatcher (*Myiarchus cinerascens*), Scott's oriole (*Icterus parisorum*), and phainopepla (*Phainopepla nitens*). The Arizona Partners in Flight Conservation Plan lists bird species that are indicators of Sonoran desertscrub habitat health; Costa's hummingbird (*Calypte costae*), gilded flicker (*Colaptes chrysoides*), rufous-winged sparrow (*Aimophila carpalis*), Le Conte's thrasher (*Toxostoma lecontei*), and purple martin (*Progne subis*) (Latta et al. 1999). Smaller mammals that use the habitats in the region include primarily nocturnal rodents; lagomorphs, including cottontails and jackrabbits; kit fox; badger (*Taxidea taxus*); and bobcat (*Felis rufus*). Large mammals, such as coyote, mountain lion (*Felis concolor*), and desert mule deer, and corvids (crows and ravens) occur from the deserts into the forested areas.

The BMGR MOAs and ranges provide habitat for at least 62 species of Sonoran Desert mammals, over 200 species of birds, 5 species of amphibians, and 37 species of reptiles (Arizona ANG 2003). Species common to BMGR include those listed above, as well as desert bighorn sheep (*Ovis canadensis nelsoni*), collared peccary or javelina (*Pecari tajacu*), Sonoran collared lizard (*Crotaphytus nebrius*), and sidewinder (*Crotalus cerastes*), plus sensitive species discussed in Section LU 3.8.

Typical species of the Upper Sonoran and Canadian Life Zones under the proposed project airspace include black bears (*Euarctos americanus*); various woodpeckers; raptors; various tree squirrels (Sciuridae); and a variety of species of owls, hummingbirds, tanagers, vireos, and flycatchers.

Auxiliary Airfields

Aux-1. Aux-1 is situated near Wittmann, Arizona, in the city limits of Surprise, approximately 13 miles north of Luke AFB. This airfield (like Luke AFB), occurs in the Lower Colorado River Valley subdivision of the Sonoran Desert (Turner and Brown 1982). Like Luke AFB, Aux-1 has a history of disturbance that includes dirt roads; cleared areas for bivouac facilities; parking areas; and a number of foxholes, trenches, and gun placement sites. Even though most of the site is undeveloped, a few stands of creosotebush-bursage vegetation persist among weedy perennial and annual species that dominate, even on runways (Air Force 2006b). Mesquite and occasional blue palo verde occur in drainages and other low-lying areas.

Wildlife species populations that occur at Aux-1 are similar to those listed for Luke AFB. Common species include small, nocturnal burrowing rodents, such as pocket mice and kangaroo rats. Diurnal rodent species that are known or thought to be common on the site include the round-tailed ground squirrel and Arizona cotton rat. No surveys of bat species have been conducted at Aux-1, but, given the site location and habitats present, it is likely that several bat species occur. Other mammals that are likely to occur at Aux-1 include the black-tailed jackrabbit, coyote, kit fox, badger, bobcat, and possibly desert mule deer (*Odocoileus hemionus crooki*) and javelina (Air Force 2006b). Local wildlife coexist with approximately 19,000 military aircraft overflights annually at Aux-1 that primarily occur on an irregular basis (ADC 2004).

Gila Bend AFAF. Gila Bend AFAF is located 50 miles south of Luke AFB. Gila Bend AFAF is in the Lower Sonoran Zone and supports Sonoran Desert vegetation types on a flat plain that slopes gently downward toward the Gila River. Habitats and wildlife species that occur there are similar to those described for Luke AFB. Since Gila Bend AFAF is a currently active airfield, wildlife species in the vicinity are exposed to human and aircraft activity (about 9,600 annual airfield operations) on a regular basis. Vegetation on Gila Bend AFAF is extremely limited, consisting primarily of nonnative forbs and grasses, which provide poor habitat for wildlife (Air Force 2009a).

LU 3.6.2.2 Airspace Environmental Consequences

Operations impacts on biological resources from the F-35A aircraft scenarios could result from low-level overflights and associated noise, sonic booms, munitions use and the use of flares, and bird–aircraft collisions. A comprehensive review of current literature evaluating potential effects on wildlife and habitat from overflight, noise, and sonic booms is presented in Appendix B.

Low-Level Overflight and Noise. All airspace units that would be used for F-35A training are currently used as active military airspace by military jet aircraft; therefore, wildlife in these areas have previous exposure to military jet overflight, including low-level overflight and noise, sonic booms, and use of munitions and defensive countermeasures that would be associated with introducing the F-35A aircraft and will be analyzed in this section. The sudden visual appearance of the aircraft and onset of noise from a low-level overflight has the potential to startle wildlife. Both the visual appearance and noise levels of aircraft diminish rapidly with increasing altitude.

Unlike the F-16, F/A-18, and A-10 aircraft, which regularly use the airspace and MTRs and include training at low altitudes, no F-35A low-level flight training is expected to occur below 500 feet AGL. Most of the F-35A training (93 percent) would occur at altitudes exceeding 5,000 feet AGL, with approximately 7 percent of training time projected to occur between 500 feet AGL and 5,000 feet AGL (see Table LU 2.2–3). Under the six F-35A beddown scenarios, the change in total annual sortie-operations flown in the primary use training airspace units relative to baseline conditions would range from a 54 percent decrease to an increase of 96 percent (see Table LU 2.2–1). For MTRs, a range of decreased annual sortie-operations use from 8 to 81 percent would occur under Scenario L3 (72 aircraft) (see Table LU 2.2–2 for all scenarios). Animals such as raptors, including bald and golden eagles, and ungulates, such as mule deer or bighorn sheep, living beneath those airspace units in which there would be an increase in operations are not expected to detect additional overflights from the F-35A due to the small use increase and the fact that these flights generally occur at much higher altitudes than operations conducted by the F-16s and A-10s currently using the airspace.

At the altitudes where the F-35A would spend most of its time, overflight noise (as perceived from the ground) would increase relatively gradually from ambient to the peak noise level. Overflight events at these altitudes would not be expected to be startling to animals or to have other adverse impacts. In addition, wildlife and domestic animals regularly exposed to noise events such as overflights have been shown to habituate to those stimuli that prove to be of no danger (Bayless et al. 2004; Brown et al. 1999; Conomy et al. 1998; Krausman et al. 1998; Workman et al. 1992). Based on (1) the very low percentage of time spent in low-level flight by F-35As training within the airspace and (2) the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, overflights or noise from the addition of F-35A training are not likely to adversely affect vegetation or wildlife.

Sonic Booms. The sound of a sonic boom can be like thunder: either a sharp double clap if the aircraft is directly overhead or a distant rumble if the aircraft is at a distance. The intensity of the boom (overpressure) at the Earth's surface decreases with an increase in the altitude at which the aircraft goes supersonic. Overall, studies of wildlife and domestic animals have demonstrated that behavioral responses are of short duration and rarely result in injury or negative population effects (Krausman et al. 1998; Weisenberger et al. 1996). Habituation to more-frequent sonic booms may also occur (e.g., Ellis et al. 1991; Workman et al. 1992). Habituation to thunderclaps and rumble associated with seasonally frequent thunderstorms within the ROI is also expected to minimize the response of birds, mammals, and domestic animals to sonic booms.

Supersonic operations are permitted in the Gladden, Bagdad, and Sells MOAs at altitudes above 10,000 feet MSL and in the R-2301E Air-to-Air and BMGR North/South TAC Range airspace units at altitudes above 5,000 feet AGL. Supersonic operations are not authorized in the R-2304/R-2305 BMGR East TAC Range airspace unit or on MTRs. At a given altitude, overpressures associated with an F-35A sonic boom are slightly higher than those produced by the F-16 (see Table LU 3.2–8). However, the overall number of booms per day beneath all primary training airspace units is projected to decrease under all beddown scenarios due to expected reductions in F-16 operations in the primary use airspace (see Table LU 3.2–6). Based on the fact that sonic booms and seasonally frequent thunderclaps currently exist in the training airspace, that the majority of training flights take place at altitudes above 10,000 feet AGL

(85 percent), and that free-ranging wildlife have generally minimal responses to sonic booms, it is not expected that the projected incremental decrease in sonic booms associated with F-35A training at Luke AFB would result in a significant impact on wildlife.

Munitions Use and Defensive Countermeasures. The primary air-to-ground range available to Luke AFB is approximately 1.05 million acres at BMGR East. All ranges proposed for the use of live and inert munitions by the F-35A training currently support munitions use. Munitions use is restricted to specific designated target areas on ranges within BMGR, which are maintained in a mowed or bladed (bare ground) condition to minimize fire hazard. Target areas would not generally attract sensitive wildlife species because of limited habitat and resource availability, but sensitive species may occasionally occur there. Precautionary measures already in place at BMGR include monitoring for Sonoran pronghorn presence prior to activities at the tactical and manned ranges, noting approximate locations of pronghorn detected from observation points and generating a target closure list based on the coordinates and the type of ordnance.

In contrast to most other military jet aircraft, the F-35A would not deploy chaff as a defensive countermeasure against radar-guided missiles. It would deploy defensive flares to counter heat-seeking missiles, as do most other military jet aircraft. Residual materials from a deployed flare likely to reach the ground are listed in Table 2–11 and include a small square piece of plastic or nylon, a small square piece of silicon foam, a plastic spring device, and a strip of graphite material similar to duct tape. Should one of these items be encountered by a wild or domestic animal, the animal is not expected to consume it or otherwise be affected by it.

Flares are designed to self-consume before reaching the ground. In the event a flare were to reach the ground while still burning, it could ignite dry vegetation and start a wildland fire. In fire-prone areas, special altitudinal restrictions on flare use may be instituted to minimize the potential for a burning flare to reach the ground. Risks of starting a fire remain extremely small as long as the minimum altitude for flare deployment remains above 2,000 feet AGL and restrictions on flare use in extreme fire conditions continue to be established by a Command or base. Generally, the duration of a flare burn is a few seconds and the flare burns out within a few hundred feet of its release altitude. Flare use by the F-35A would be restricted to any airspace and altitudes where flare use is currently authorized. Restricting flare use to authorized airspace and altitudes reduces the potential for wildland fire ignition and spread.

The potential for wildland fire in Lower Sonoran Life Zone ecosystems has historically been very low because the native vegetation was too sparse to carry fire. Recent spread of invasive nonnative grasses (such as buffelgrass) has increased the frequency of fire, which can kill creosotebush and some of the other dominant desertscrub species outright. At higher elevations, periodic wildland fire is a regular occurrence in desert grassland ecosystems, and the vegetation and wildlife species are well-adapted to periodic fire, having mechanisms to escape and survive fire and to regenerate after fire. It is unlikely that flare use associated with the F-35A training would appreciably increase the incidence of rangeland fires given measures implemented to reduce the potential for fire from flare use; therefore, impacts on vegetation and wildlife would be less than significant. Additional details on flares are presented in Chapter 2, Section 2.4.5. Bird–aircraft or other wildlife–aircraft collisions would occur infrequently and would not represent a substantial source of mortality for any species.

Auxiliary Airfields

Aux-1. Airfield operations at Aux-1 would range from a decrease to 74 percent of baseline levels (under Scenario L1) to an increase of 44 percent (under Scenario L6) compared with baseline annual airfield operations of 18,954. These operations would not involve actual takeoffs and landings due to the non-functional condition of the runway. Therefore, these types of changes are not expected to significantly change the potential for BASH at Aux-1.

Gila Bend AFAF. Annual airfield operations would increase considerably at Gila Bend AFAF with the introduction of F-35A training, with the increase ranging from 25 percent (under Scenario L1) to 325 percent (under Scenario L6) relative to baseline annual airfield operations of 9,641. This increase has the potential to contribute to an incremental increase in BASH. However, incidences of BASH-related mishaps in this portion of BMGR East are rare. Bird–airstrike avoidance protocols are in place at Gila Bend AFAF to minimize risk to pilots, aircraft, and wildlife (Air Force 2009a).

LU 3.7 Wetlands and Aquatic Communities

LU 3.7.1 Base

LU 3.7.1.1 Base Affected Environment

No wetlands have been identified at Luke AFB (USACE 1994). A drainage ditch located on the northern boundary of the base was found to support hydrophytic vegetation and evidence of wetland hydrology, but hydric soils were not present. A drainage ditch running along the western perimeter of the base also supports hydrophytic vegetation. According to the Luke AFB INRMP (Air Force 2006b), this drainage ditch likely receives runoff water from adjacent agricultural fields and, apparently, has sufficient water to support populations of lowland leopard frogs (*Rana yavapaiensis*), a sensitive species, and introduced bullfrogs (*Rana catesbiana*). A site must display evidence of all three wetland indicators to be considered a wetland, or, in the case of a problem area (i.e., arid regions), hydric soil indicators are considered a constant factor during the drier times of the growing season (USACE 1994). Several small drainages that traverse the property may qualify as jurisdictional waters of the United States but not as wetlands.

LU 3.7.1.2 Base Environmental Consequences

No wetlands or aquatic communities would be within the construction zones where they could be directly affected by construction. Measures to control erosion, siltation, and fugitive dust would be included as part of the project implementation, minimizing the potential for construction to indirectly affect offsite aquatic and wetland habitats and biota. No effects on aquatic and wetland habitats are expected from F-35A operations in the vicinity of Luke AFB.

LU 3.7.2 Airspace

LU 3.7.2.1 Airspace Affected Environment

The great species richness in desert riparian and wetland areas underscores the importance of these habitats despite their limited areal extent. Surface-water resources underneath the airspace are very limited and not fully mappable at the scale of the Arizona Game and Fish Department (AZGFD) GIS data used for this analysis. As described for the smaller base and airfields, the presence of surface water is typically dependent on the season and recent precipitation events on the majority of the airspace. Surface water catchments include natural rock depressions (referred to as "tinajas"), sand tanks (saturated sand depressions), charcos (pools within adobe flats and washes), playas (closed basin drainages), and/or springs and seeps.

Arroyos and other ephemeral stream channels dispersed throughout the areas underlying training airspace contain water only following storm events, typically existing in a dry condition. Although there are few year-round wetlands, most of the intermittent surface drainages under the project airspace are considered jurisdictional waters of the United States and are therefore subject to the Clean Water Act (Air Force 1998).

Auxiliary Airfields

Aux-1. No federally designated wetlands occur at Aux-1 (Air Force 2006b). Manmade canals and five small, unnamed drainages carry surface-water runoff, when available, from Aux-1 to Trilby Wash south of the runway (Air Force 2006b). Runoff then flows into the Trilby Wash Detention Basin and from there to the Agua Fria River, which drains to the Gila River. The Granite Reef Aqueduct of the Central Arizona Project passes along the northwestern boundary of Aux-1. Although Aux-1 does not support any wetlands, several of the drainages that traverse the property qualify as waters of the United States (Air Force 2006b).

Gila Bend AFAF. Gila Bend AFAF is located 3 miles south of the community of Gila Bend, which encompasses over 25 miles of Gila River shoreline on its western and northern border (Gila Bend 2006). As with the adjacent BMGR, there are no perennial or intermittent streams present on Gila Bend AFAF and ephemeral stream flow, in otherwise dry stream beds, occurs only in immediate response to sizable rainfall events, primarily in winter and summer (Air Force 2009a). Two larger, named drainages that traverse diagonally across the southwestern quarter of Gila Bend AFAF are Sauceda and Quilotosa Washes, which drain the Sauceda Valley to Gila River. These washes are considered jurisdictional waters of the United States and would be subject to the Clean Water Act if disturbance of washes were proposed (Air Force 2009a). No jurisdictional wetlands are present on Gila Bend AFAF.

LU 3.7.2.2 Airspace Environmental Consequences

No adverse effects on aquatic and wetland habitats are expected from F-35A training operations in project airspace. There is a very low probability that an unburned flare or material from a flare would reach an aquatic or wetland environment. Magnesium, the major chemical component of flares, can be toxic at extremely high levels, a situation that could occur only under repeated and concentrated use in localized areas, which would not occur because of the

widely dispersed nature of flare deployment and the near absence of perennial surface waters. No adverse effects on aquatic and wetland habitats are expected from F-35A training use of the auxiliary airfields (Aux-1 or Gila Bend AFAF) because no ground disturbance would occur.

LU 3.8 Threatened, Endangered, and Special Status Species

The U.S. Fish and Wildlife Service (USFWS) maintains the list of species protected under the Endangered Species Act (ESA) (16 *United States Code* [U.S.C.] 1536). In addition, AZGFD compiles its own list of species considered threatened and endangered in Arizona. Under the Arizona Native Plant Law (*ARS* Title 3, Chapter 7, "Arizona Native Plants"), protected native plants cannot be removed from any Arizona land without the permission of the landowner and a permit from the Arizona Department of Agriculture. Lessees of Federal and state land must obtain specific authorization from the landowner to remove protected native plants (AZDA 2010). Plants that fall under this law typically have value in landscaping and as ornamentals or collector's items and include the saguaro, hedgehog cactus, pincushion cactus, and numerous others.

LU 3.8.1 Base

LU 3.8.1.1 Base Affected Environment

No animals or plants protected under the ESA are known or expected to occur on Luke AFB (Air Force 2006b). Some plants with protected status under the Arizona Native Plant Law occur on Luke AFB and/or have been included in landscaping on base (e.g., saguaros).

Two bird species with special status have been known to occur at Luke AFB: ferruginous hawks and western burrowing owls (Air Force 2006b). Several western burrowing owls occupying nests along the perimeter road in proximity to the runway were relocated in the late 1990s. None have been sighted near the runway since. Although not federally listed as threatened or endangered, the burrowing owl is a USFWS species of concern and, along with the ferruginous hawk, is protected under the Migratory Bird Treaty Act of 1918. Attempts are made to discourage raptors from hunting in the mowed areas around the runway due to the potential for BASH (see Section LU 3.4). Base Wildlife Service personnel have also relocated some burrowing owls that have been determined to be a hazard to aircraft (Air Force 2006b). Working with AZGFD, base personnel are conducting ongoing surveys to assess the burrowing owl population size and making adjustments to mowing schedules to reduce these hazards. According to the Luke AFB INRMP (Air Force 2006b), the lowland leopard frog (*Rana yavapaiensis*), also considered a Federal species of concern, is present in a drainage ditch along the western perimeter of the base (evidently fed by drainage from nearby irrigated agricultural land) and is a prey species for the burrowing owl.

LU 3.8.1.2 Base Environmental Consequences

No known federally listed threatened or endangered wildlife species or their habitats occur on Luke AFB; therefore, no adverse effects on federally list wildlife are anticipated from implementation of the F-35A aircraft scenarios at Luke AFB. No significant impacts from airfield operations would be expected on special status wildlife that may occur on base due to

the qualitatively similar nature of F-35A operations to current and historical operations associated with the existing military airfield environment at Luke AFB.

LU 3.8.2 Airspace

LU 3.8.2.1 Airspace Affected Environment

As part of the environmental impact analysis process for this project, USFWS and AZGFD were contacted for information on species of concern in the project area. Federally listed, proposed, or candidate species that are known to or likely to occur in the action area, including areas underlying primary use airspace, are presented in Table LU 3.8–1. For this analysis, "action area" includes Luke AFB and vicinity, Gila Bend AFAF, Aux-1, and associated existing SUA and ranges identified in Figure 2–2. Since use of occasional use airspace by F-35A is expected to be incidental and minor compared to the proposed use of primary use airspace by F-35A, it is not evaluated further in this document.

Species that occur under the project airspace have been exposed to past and ongoing military overflights similar to those being proposed for this project. Because the project area is currently used airspace, many investigations into sensitive species have been conducted. A recent comprehensive review of special status species that occur in BMGR is available in the *Draft Environmental Impact Statement Proposed Range Enhancements at Barry M. Goldwater Range East* (Air Force 2009a). Designated critical habitat for two listed birds, the Mexican spotted owl and southwestern willow flycatcher, is crossed by MTRs. In addition, critical habitat for three listed fish species, the endangered razorback sucker, the threatened spikedace, and the endangered Gila chub, occurs in the major rivers crossed by MTRs (the Verde, Salt, San Pedro, Agua Fria, and Gila Rivers.

Considering the nature of the proposed uses of the project airspace, no effects are anticipated on the fish or plant species listed in Table LU 3.8–1 or their associated habitats. For this reason, further discussion of these fish and plant species is not included. Species that could possibly be affected by the proposed project actions include birds, bats, reptiles, and large mammals at sensitive life stages (such as during breeding or during severe winters). These species are discussed in more detail below.

Lesser Long-Nosed Bat. The lesser long-nosed bat was federally listed as endangered in 1988. Its range extends from southwestern New Mexico, through southern and central Arizona, into western Mexico. This species is present in Arizona from April through October and migrates to Mexico in the winter months. This bat feeds on nectar and pollen at night, primarily that of columnar cactic (such as saguaro) and agave species. Lesser long-nosed bats roost in mines and natural caves during the daylight hours. The distribution of this species in the project area is not well known, but it is likely to occur under project airspace in southern Arizona. Threats to the species include loss or disturbance of roosts and maternity sites and loss of sufficient agave populations (Arizona ANG 2003).

Table LU 3.8–1. Federally Listed, Proposed and Candidate Species Known or Likely to Occur Within the Action Area

Common Name/ *Scientific Name*	Federal Status	Luke AFB	Sells MOA	Bagdad MOA	Gladden MOA	Restricted Airspace over BMGR [1]	MTRs	Gila Bend AFAF	Aux-1
Lesser long-nosed bat *Leptonycteris curasoae yerbabuenae*	E		X			X			
Sonoran pronghorn *Antilocapra americana sonoriensis*	E					X (R-2301E)			
Masked bobwhite *Colinus virginianus ridgwayi*	E		X [2]						
Southwestern willow flycatcher *Empidonax traillii extimus*	E			X+			X+		
Yuma clapper rail *Rallus longirostris yumanensis*	E		X	X					
Mexican spotted owl *Strix occidentalis lucida*	T						X+		
Western DPS of the yellow-billed cuckoo *Coccyzus americanus occidentalis*	C			X	X		X		
Tucson shovel-nosed snake *Chionactis occipitalis klauberi*	C		X				X		
Sonoran desert tortoise *Gopherus agassizii = G. morafkai*	C		X	X	X	X	X		
Desert tortoise (Mohave population)[3] *Gopherus agassizii*	T								
Razorback sucker *Xyrauchen texanus*	E						X+		
Spikedace *Meda fulgida*	T						X+		
Gila chub (*Gila intermedia*)	E						X+		
Pima pineapple cactus *Coryphantha scheeri* var. *robustispina*	E		X						

[1] Includes R-2301E, R-2304, and R-2305.
[2] Present in Buenos Aires NWR outside the eastern boundary of the Sells MOA.
[3] Not present in Arizona. Species and critical habitat found under occasional use airspace in eastern California.
Key: C=Candidate species for listing; DPS=Distinct Population Segment; E=Listed under ESA as endangered; T=Listed under ESA as threatened; X+ = USFWS designated critical habitat present.
Sources: Arizona ANG 2003; AZGFD 2004b, 2004c; USFWS 2003, 2004, 2005, 2007, 2008a, 2008b, 2008c, 2008d, 2009, 2010a, 2010b, 2010c.

Sonoran Pronghorn. This is one of five recognized subspecies of pronghorn found in North America and the only one listed (as endangered) under the ESA. The historic distribution of the Sonoran pronghorn is not definitively known because the population and range of the species had already suffered significant declines before it was recognized as a distinct subspecies in 1945. This subspecies is associated with Sonoran Desert scrub habitats, which are declining as

the result of vegetation conversion for farming, irrigation, livestock grazing, development of urban areas and roads, and the loss of vital riparian corridors (USMC 2001). In the United States, the present distribution of the Sonoran pronghorn is limited to portions of BMGR. The species also occurs in the adjacent state of Sonora, Mexico. Sonoran pronghorn population numbers in the United States have fluctuated due to several factors, showing a declining trend from a high of 282 in 1994 to a low of 21 in 2002 following extreme drought (Air Force 2009a). A captive breeding program was initiated in 2004 in the United States with the cooperation of Mexico to ensure genetic diversity. USFWS drafted an EA to establish a second U.S. population of endangered Sonoran pronghorn and identified Kofa NWR in Yuma County as its preferred reintroduction location (USFWS 2008e). The NWR was established in large part for the protection of desert bighorn sheep (*Ovis canadensis nelsonii*).

Southwestern Willow Flycatcher. Willow flycatchers (*Empidonax traillii*) are fairly common throughout the southwest during migration, but the endangered southwestern willow flycatcher subspecies (*E. t.* ssp. *extimus*) breeds only in a few scattered drainages across seven southwestern states in healthy stands of dense riparian forests, habitats that have been much diminished from historical occurrences. USFWS-designated critical habitat occurs along narrow bands that follow the largest remaining river courses in the arid region, including, primarily, the Gila and San Pedro Rivers under project airspace. Southwestern willow flycatcher critical habitat occurs under the MTRs VR-239, VR-241, VR-244, and VR-245, and under a small portion of the Bagdad MOA.

Mexican Spotted Owl. The Mexican Spotted Owl (MSO) (ESA-listed as threatened) typically nests and roosts in closed-canopy, old-growth montane coniferous forests or rocky canyons. MSOs may also nest on cliff ledges, in caves, in stick nests built by other birds, on debris platforms in trees, and in tree cavities. Federally designated critical habitat for the MSO occurs in patches within the forested regions of eastern and central Arizona. Stand-replacing wildfire is considered the greatest current threat to the species (USFWS 2011) and is related to forest management practices. Primary constituent elements of the critical habitat relate to forest structure, maintenance of adequate prey species, and canyon habitat (USFWS 2011). MSO critical habitat is present under the following MTRs that would be used by the project: VR-239, VR-241/244, VR-242, and VR-243. The MTRs average about 260 NM in total length, and the critical habitat is very localized along the routes. The length of critical habitat overlain by each MTR ranges from 3.7 to 22 NM, depending on the route.

Masked Bobwhite. A desert grassland species, this endangered quail was extirpated from the United States around 1900 due to habitat loss and deterioration resulting from human land uses (USFWS 2002). A refuge population was established in 1985 at the Buenos Aires NWR through the reintroduction of birds from Sonora, Mexico. The small population at Buenos Aires NWR is supported by captive breeding. This refuge is outside the eastern boundary of the Sells MOA adjacent to project airspace.

Yuma Clapper Rail. The U.S. breeding population of Yuma clapper rails is a generally non-migratory, year-round resident population, although some birds may winter in nearby Mexico. This secretive marsh bird's preferred habitats are freshwater and alkali marshes along the margins of ponds with stable water levels and containing dense stands of cattails (*Typha latifolia*) and bulrushes (*Scirpus acutus*). Nesting may occur on hummocks or low shrubs among

dense cattails (NatureServe 2010). Mapped distributions of Yuma clapper rails in Arizona include one known site under the Bagdad MOA and one site under the Sells MOA on the Mexican border under the project ROI (AZGFD 2004b). All other occurrences are in association with the Colorado, Gila, Salt, and Verde Rivers.

Western Population of the Yellow-Billed Cuckoo. The two subspecies of yellow-billed cuckoo (eastern and western) are considered geographically separated by the Continental Divide (USFWS 2010a). The western Distinct Population Segment (DPS) of the yellow-billed cuckoo was accepted as a candidate species for listing under the ESA in 2001. Western yellow-billed cuckoos are migrants that prefer open woodland with clearings and thick, scrubby undergrowth along watercourses (USFWS 2010a). Nesting occurs almost exclusively close to water with canopy cover of at least 50 percent in both the understory and overstory. Due to extensive riparian habitat loss from changes in flow regimes of the major rivers, the overall range of the western yellow-billed cuckoo has decreased dramatically (USFWS 2010a). Its known occurrences in Arizona are along the Bill Williams River underlying Bagdad and Gladden MOAs, along the Colorado River mainstem, and along the other major tributaries to the Gila, Salt, San Pedro, and Santa Cruz Rivers.

Tucson Shovel-Nosed Snake. The Tucson shovel-nosed snake is a small burrowing species that preys on insects and other invertebrates. It inhabits sandy soils, where it uses "sand swimming" as its primary locomotion. It is primarily active between dusk and dawn, although it may be active in the morning and just before sunset. The distribution of this subspecies historically included portions of Pima, western Pinal, and a portion of eastern Maricopa counties (USFWS 2010b). Much of its original range has been converted to urban development or agriculture. The remaining distribution is believed to be primarily in the corridor between the Tucson and Phoenix metropolitan areas (USFWS 2010b). The principal threats to the species include continued loss of habitat to human development, road construction, maintenance and use, and wildfire associated with the spread of invasive, nonnative grasses (USFWS 2010b).

Sonoran Desert Tortoise/Morafka's Desert Tortoise. As of June 2011, Morafka's desert tortoise (*Gopherus morafkai*) was named, encompassing desert tortoise populations in Arizona and Sonora and separating them from Agassiz's desert tortoise (*Gopherus agassizii*) populations occurring in California, Nevada, and Utah. This newly named entity had been previously referred to as the "Sonoran population of the desert tortoise" or "Sonoran desert tortoise." The Sonoran desert tortoise was made a candidate species on December 14, 2010 (USFWS 2010c). The Mojave Desert DPS of *Gopherus agassizii* that occurs in California, Nevada, and Utah is listed as threatened under the ESA. Morafka's desert tortoise (*Gopherus morafkai*) currently has no Federal status but is considered a species of greatest conservation need under Arizona's Comprehensive Wildlife Conservation Strategy: 2005–2015, completed by AZGFD (AZGFD 2006). The Draft Desert Tortoise Recovery Plan Revision (USFWS 2008f) determined that, because there are only minor visual differences between the animals in the Mojave and Sonoran populations, the Sonoran population (Morafka's) also warranted protection as a threatened species under Section 4(e) of the ESA (similarity of appearance). Morafka's desert tortoise is found primarily on rocky slopes and bajadas of Sonoran desertscrub vegetation communities. These tortoises hide and burrow under rock crevices, in caliche caves and in incised, cut banks of washes (arroyos), especially in the Lower Colorado River Valley subdivision. Desert tortoises have been confirmed in several mountainous locations on

BMGR East. BLM has designated and categorized essential and nonessential suitable habitat for Morafka's desert tortoise in areas underlying the Gladden, Bagdad, and Sells MOAs, under R-2301E, and underlying all of the proposed Visual Routes.

Mojave Population of Desert Tortoise. Desert tortoise (*Gopherus agassizii*) occurring in California, Nevada, and Utah are recognized under the ESA as the Mojave Population of Desert Tortoise. These tortoises are listed as threatened. Designated critical habitat underlies portions of occasional use airspace units in eastern California.

Auxiliary Airfields

Aux-1. No federally listed plant or wildlife species are present on Aux-1. Plant species protected by the Arizona Native Plant Law, such as species of cacti, mesquite, foothill and blue palo verde, and ocotillo, are present on Aux-1 (Air Force 2006b). Two special status bird species have been recorded on Aux-1. Burrowing owls, primarily year-round residents in Arizona, are known to be present, and ferruginous hawks use Aux-1 for winter foraging (Air Force 2006b).

Gila Bend AFAF. There is suitable habitat for the western burrowing owl on disturbed lands of the airfields, but no known records of this species' occurrence.

LU 3.8.2.2 Airspace Environmental Consequences

The potential for adverse effects of F-35A training in the airspace and at the auxiliary airfields on endangered, threatened, or special status wildlife is minimal as described above for vegetation and wildlife (see Section LU 3.1.2.3). Because effects on a single individual of a federally listed endangered or threatened species could be significant, however, a more-detailed consideration of impacts is required for these species. In the analysis that follows, the focus is on the activities of the aircraft in airspace overlying habitat that may be occupied by endangered or threatened species and a comparison with existing conditions, including aircraft activity in the same locations. This is followed by a species-by-species synopsis of potential effects.

All F-35A flight activities would take place in existing airspace; therefore, no airspace modifications would be required. Activities required for the F-35A on training ranges and in airspace would be similar to existing use by F-16s, which currently fly in the airspace. Proportionately more of the F-35A sorties would occur at higher altitudes than those of the aircraft currently using the airspace, which is expected to reduce the potential to startle wildlife and domestic animals with noise and the sudden appearance of overflying aircraft. Table LU 2.2–3 provides a comparison of altitude use between A-10 and F-16 aircraft, which currently use the airspace, and F-35A aircraft. Only 15 percent of F-35A flight hours would be below 10,000 feet AGL, whereas 96 percent and 56 percent of the flight hours of A-10s and F-16s, respectively, would be spent below 10,000 feet AGL. At the altitudes where the F-35A would spend most of its time, overflight noise (as perceived from the ground) would increase relatively gradually from ambient to the peak noise level. Overflight events at these altitudes would not be expected to be startling to animals or to have other adverse impacts. Guided munitions used for F-35A training would be expected to be released from higher altitudes than conventional munitions employed by existing aircraft using the training ranges. Their use would be confined to existing target areas within existing restricted airspace.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training. Supersonic flight is not authorized on MTRs. Sonic booms generated by F-35A aircraft are expected to be similar in terms of frequency of boom events per sortie to F-16 supersonic flight. The addition of F-35A supersonic operations would be offset by decreases in F-16 supersonic operations, and the projected average number of sonic booms per day would decrease under all scenarios beneath all primary training airspace units (see Table LU 3.2–5).

Table LU 3.8–2 provides a species-specific assessment of potential effects on endangered, threatened, and sensitive species in the ROI.

Table LU 3.8–2. Potential Effects on Federally Listed, Proposed, and Candidate Species That May Occur Under Primary Use Airspace and on Ranges

Species[1]	*Potential Presence in Project ROI*	*Potential Adverse Effects*
Lesser long-nosed bat	Likely occurs under airspace on BMGR and Sells MOA, where it is present during the late spring/summer flowering season of columnar cacti and agaves, which it pollinates.	Low potential for effect on nighttime foraging within the airspace. These bats are unlikely to be in the vicinity of the airfields at Luke AFB, Aux-1, and Gila Bend AFAF, where low-level flight on approach and takeoff would be most frequent, because of relative lack of food plants. Minimal potential for effect during daytime, when the bats are roosting underground.
Sonoran pronghorn	On BMGR.	Low-level overflight with F-35A would be considerably less frequent than for baseline aircraft currently using the airspace. Inexperienced animals may initially react behaviorally to sonic booms or low-level overflights, but would not reach the scale at which take would occur. Species conservation and impact minimization measures are already in place for Sonoran pronghorn at BMGR (USFWS 2010d). These include biological monitoring of Sonoran pronghorn prior to activities at the tactical and manned ranges, noting approximate locations of pronghorn detected from observation points, and generating a target closure list based on the coordinates and the type of ordnance. Conservation measures for Sonoran pronghorn recovery actions supported annually by the Air Force include radio collaring; aerial telemetry flights; studies of diet, habitat use and genetics; forage enhancement; and a captive breeding project (USFWS 2010d).
Southwestern willow flycatcher	Breeds in dense riparian habitat very localized under the airspace.	Introduction of the F-35A aircraft would represent a minimal departure from existing conditions, and slight changes in the noise environment are not expected to adversely affect the southwestern willow flycatcher. Its preferred habitat of thick, riparian canopy cover is expected to minimize or eliminate any visual appearance of an overflying aircraft. The potential for a bird–aircraft strike is so low as to be discountable.
Mexican spotted owl	Occupied habitat, including Critical Habitat, is crossed by VR-239, -241/244, -242, and -243.	The potential for overflight impacts on the MSO have been studied in some detail. MSO did not flush from a nest or perch unless a helicopter was as close as 330 feet (Delaney et al. 1997). Minimal responses to F-16 overflights were exhibited at elevations of about 2,000 feet above a MSO (Johnson and Reynolds 2002). It was also noted that MSO responses to the F-16 overflights were often less than their responses to naturally occurring events such as thunderstorms. Supersonic flight is not authorized on MTRs, including the VRs that cross MSO habitat. A 6-year study conducted by Air Combat Command (ACC 2008) during April through July from

Species[1]	*Potential Presence in Project ROI*	*Potential Adverse Effects*
		2000 through 2005 found that aircraft overflight had no effect on occupancy of MSO activity centers and found no correlations among measures of aircraft exposure and nesting success. Additionally, no flushing or loss of adults or young was observed in response to any aircraft overflights, including 40 observations of military jet aircraft overflight that came within 500 feet of owls. Based on these results, overflight by F-35A aircraft at 500 feet AGL and above is not expected to reach the scale at which take would occur. Additionally, of the five MTRs that overlie MSO critical habitat, four would experience decreases in sortie operations of 28 percent to 78 percent associated with basing 144 F-35As at Luke AFB. Sortie-operations on route VR-239 would increase 30 percent, but the total numbers would be low at 354 events annually. Furthermore, only about 9.5 miles of this route overlie MSO critical habitat, which would be transited by an F-35A in about 1 minute. Therefore, overflight by F-35A aircraft is expected to have insignificant effects on MSO and not reach the scale at which take would occur. In addition, the chance of accidental MSO-aircraft strike is so unlikely as to be discountable. Use of defensive flares is not authorized on MTRs, and the project would not adversely modify MSO critical habitat or its primary constituent elements.
Masked bobwhite	Limited range outside the eastern boundary of Sells MOA and therefore not under regularly used airspace.	Very low to no potential for effect.
Yuma clapper rail	Small, localized populations associated with marshes on the Colorado, Gila, Salt, and Verde Rivers primarily not under the airspace.	Very low to no potential for effect.
Yellow-billed cuckoo (Western DPS)	Limited range along riparian habitats under airspace.	Introduction of the F-35A aircraft would represent a minimal departure from existing conditions and slight changes in the noise environment are not expected to adversely affect the western yellow-billed cuckoo. Its preferred habitat of thick, riparian canopy cover is expected to minimize or eliminate any visual appearance of an overflying aircraft. The potential for a bird-aircraft strike is so low as to be discountable.
Tucson shovel-nosed snake	Possible occurrence under airspace.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions for this species and slight changes in the noise environment are not expected to be perceptible to or adversely affect the Tucson shovel-nosed snake. An individual's response, if any, to overflight would most likely be to "freeze" (i.e., become immobile) momentarily without any harm to the individual. Burrowing habits and activity of the species primarily between dusk and dawn would minimize the exposure of the species to overflight.

Species[1]	*Potential Presence in Project ROI*	*Potential Adverse Effects*
Sonoran desert tortoise/Morafka's desert tortoise	Potential occurrence in Sonoran Desert habitats under the airspace.	Introduction of the F-35A aircraft would represent a minimal departure from existing conditions, and slight changes in the noise environment are not expected to adversely affect the Sonoran desert tortoise/Morafka's desert tortoise. A comprehensive study of effects of low-level jet overflights on desert tortoises demonstrated no acoustic startle response or voiding of urine and no damage to hearing under overflight and sonic boom conditions typical of military operations areas (Bowles et al. 1999). Temporary "freezing" (i.e., remaining immobile), a typical reptilian defensive response, was noted after initial exposure to intense overflight noise, but the response diminished dramatically with subsequent exposure, indicating habituation. Given the existing exposure of tortoises to low-level military jet overflight activity in the project airspace, habituation is likely. Low-level overflight with F-35A would be considerably less frequent than for aircraft currently using the airspace. Inexperienced animals may initially react behaviorally to sonic booms or low-level overflights, but the response would not reach the scale at which take occurs.
Mohave population of the desert tortoise	Occurrence and designated critical habitat under occasional use airspace in California.	The Mohave population of desert tortoise, federally listed as threatened, does not occur under primary use airspace or ranges proposed for use by this project, although it occurs under existing special use airspace in California that may receive occasional incidental use by F-35A. Use of occasional use airspace is expected to be infrequent and use would not be expected to reach the scale at which take would occur and would not adversely modify designated critical habitat.

[1] See Table LU 3.8–1 for species status and additional information on distribution with respect to areas proposed for use for F-35A training.

In conclusion, although it is possible for a federally listed wildlife species to exhibit a temporary response to a low-level overflight or sonic boom, such as assuming an alert posture, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which "take" occurs (as defined in ESA). The probability of a bird–aircraft strike involving injury to a listed, proposed, or candidate species is so low as to be discountable. Therefore, it is concluded that the project may affect, but is not likely to adversely affect, listed or proposed species and would not adversely modify any critical habitat. With regard to the candidate species, including the western yellow-billed cuckoo DPS, Tucson shovel-nosed snake, and Sonoran desert tortoise, it is concluded that the project may affect, but is not likely to contribute to the need for Federal listing of these species. The Air Force has submitted these findings to the USFWS seeking concurrence with the determination in compliance with the ESA. In a letter dated April 27, 2012, the USFWS concurred with the determination and indicated that no further Section 7 consultation was required (see Appendix C).

LU 3.9 Cultural Resources (Archaeological, Architectural, Traditional, Native American Consultation)

For purposes of compliance with Section 106 of the National Historic Preservation Act (NHPA) and in accordance with 36 CFR Section 800.4(a)(1), the area of potential effect (APE) under the Luke AFB alternative has been defined. The APE is considered to be Luke AFB, which comprises 3,054 acres, although actual potential construction impacts would involve a much smaller area (see Figure LU 2.1–1); Gila Bend AFAF, as shown in Figures LU 3.2–7 through

LU 3.2–12; Aux-1, as shown in Figures LU 3.2–13 through LU 3.2–18; and the MOA/ATCAAs, MTRs, and Restricted Areas shown as primary use airspace in Figure LU 2.2–1. The definition of cultural resources and methodology for analysis are described in Chapter 3, Section 3.7.

LU 3.9.1 Base

LU 3.9.1.1 Base Affected Environment

Archaeological Resources. Luke AFB is considered archaeologically sensitive because of its proximity to the Agua Fria River, as evidenced by Hohokam-affiliated sites located nearby. Thirteen investigations have been conducted within the Luke AFB area (or within the several perpetual easements that abut the base). These projects were intensive pedestrian surveys and testing projects.

Three sites are located partially within the perpetual easement south of Luke AFB. Near the MSA a large archaic period site is being excavated in preparation for the construction of a solar panel array. This remarkably intact site provides a unique look at life in the Phoenix Valley 5,000 years ago. The site is eligible for the National Register of Historic Places (NRHP). Ten archaeological sites and 51 isolates have been located near the MSA. Seven of these sites have been recommended as eligible for listing in the NRHP, but some of the sites remain unevaluated. A 2005 survey in MSA II has identified 2 sites that may be NRHP-eligible and 120 isolates (Air Force 2009b).

Historic Architectural Resources. Based on the 2008 Luke AFB Integrated Cultural Resources Management Plan (ICRMP), there are 40 World War II, 502 Cold War era, and 169 post–Cold War buildings, structures, and infrastructure resources at Luke AFB. Inventories and evaluations of the World War II and Cold War era resources at Luke AFB were conducted in 1997 and 1998. Because Cold War resources were less than 50 years old at that time, they were evaluated under Criterion Consideration G. Those studies identified nine properties (Inventory Nos. 219, 415, 500, 616, 617, 940, 958, 1371, and 1384) which, although not of exceptional significance, should be re-evaluated as they approach the 50-year mark. Two of them (415 and 616) have already reached that threshold and have been found ineligible for inclusion in the NRHP (Air Force 2009b). Luke AFB currently has only one NRHP-eligible architectural property—Building 1150 (see Appendix C, Table C–10), the former Semi-Automatic Ground Environment (SAGE) Direction Center (Air Force 2009b). A search of the National Register Information System database revealed that there are no NRHP-listed properties within the boundaries of Luke AFB (NRIS 2011).

Traditional Cultural Resources and Native American Concerns. Luke AFB consults with 23 Native American groups. No traditional cultural resources have been identified within the boundaries of Luke AFB. Specific concerns that have been identified in the past include protecting and managing natural and cultural resources; determining cultural affiliation, treatment of human remains, identification of traditional cultural places, and confidentiality of sensitive information; developing a programmatic agreement to specify tribal involvement in cultural resource management; and conducting future research (AETC 2009).

LU 3.9.1.2 Base Environmental Consequences

Scenario L1. Under this scenario, 142 F-16 aircraft would be retired or relocated to other installations, and 24 F-35A aircraft would be bedded down at Luke AFB. Projected construction and renovation projects required under this scenario include construction of 8 new buildings or facilities, associated infrastructure, and additions or alterations to 16 existing buildings and 5 other structures (see Table LU 2.1–2).

Impacts on archaeological resources are not expected under this scenario. Construction of facilities would take place within the previously disturbed cantonment area of Luke AFB, which has very low probability of containing any intact cultural deposits (Air Force 2009b). All of the known archaeological sites eligible for listing in the NRHP are well outside the area within which proposed construction would occur.

There is always the possibility that previously unknown or unrecorded archaeological resources could be preserved beneath the ground surface, sometimes underneath existing development. In the event that previously unrecorded cultural resources are encountered during construction, Luke AFB would manage these resources in accordance with the Luke AFB ICRMP, adhering to Federal and state laws, as well as Air Force regulations.

Indirect impacts on archaeological resources at Luke AFB due to personnel changes are not expected, as there would be a net decrease in personnel.

Although no building demolitions are planned as a result of the F-35A beddown, impacts on architectural resources could occur under this scenario. One of nine potentially significant Cold War era buildings (958) would be affected under this and all other scenarios. In compliance with Section 106 of the NHPA, the Air Force has completed consultation with the Arizona State Historic Preservation Office (SHPO) and received the Arizona SHPO's concurrence that the F-35A training mission at Luke AFB will have no effect on historic properties (see Appendix C).

Impacts on traditional resources are unlikely under this scenario, as no Native American traditional cultural properties (TCPs) or other traditional cultural resources at the installation have yet been identified. However, government-to-government consultation with tribes is an ongoing process. In the event that previously unrecorded traditional cultural resources are encountered, Luke AFB would manage these resources in accordance with the Luke AFB ICRMP, NEPA, NHPA and other Federal and state laws, Air Force and DoD regulations and instructions, and DoD Native American policy.

Scenario L2. Under this scenario, 48 F-35A aircraft would be bedded down at Luke AFB. Projected construction and renovation projects required under this scenario would be similar to those described for Scenario L1, with three more building renovations and one additional new building constructed (see Table LU 2.1–2). Therefore, anticipated impacts on archaeological, historic architectural, and traditional resources would be similar to those described under Scenario L1.

Scenario L3. Under this scenario, 72 F-35A aircraft would be bedded down at Luke AFB. Projected construction and renovation projects required under this scenario include those described for Scenario L1 plus 11 additional new facilities, and renovations to one more building, plus four additional infrastructure modifications (see Table LU 2.1–2). Ground

disturbance associated with additional construction could increase the possibility of encountering a previously unrecorded archaeological resource, but the construction location remains within the disturbed cantonment so the likelihood is low. Anticipated impacts on archaeological, historic architectural, and traditional resources would be similar to those described for Scenario L1.

Scenario L4. Under this scenario, 96 F-35A aircraft would be bedded down at Luke AFB. Projected construction and renovation projects required under this scenario would be similar to those described under Scenario L1, with three more building renovations and 16 more new buildings or facilities and associated infrastructure constructed (see Table LU 2.1–2). Although the possibility of encountering a previously unrecorded archaeological site increases with the greater number of construction projects and associated ground disturbance, the likelihood remains low because of the disturbed nature of the location. Therefore, anticipated impacts on archaeological, historic architectural, and traditional resources would be similar to those described in Scenario L1.

Scenario L5. Under this scenario, 120 F-35A aircraft would be bedded down at Luke AFB. Projected construction and renovation projects required under this scenario would be similar to those described under Scenario L1, with four more building renovations and 18 additional new buildings or facilities and associated infrastructure constructed (see Table LU 2.1–2). The increased level of construction would increase the possibility of encountering previously unrecorded archaeological sites, but the likelihood remains low because of previous disturbance in the cantonment. Anticipated impacts on archaeological, historic architectural, and traditional resources would be similar to those described under Scenario L1.

Scenario L6. Under this scenario, 144 F-35A aircraft would be bedded down at Luke AFB. Projected construction and renovation projects required under this scenario include construction of 29 new buildings or facilities (21 more than under Scenario L1), associated infrastructure, and additions or alterations to 25 existing buildings and 9 other structures (an increase of 9 and 13, respectively, over Scenario L1) (see Table LU 2.1–2). No impacts on archaeological resources are expected as construction would take place within the previously disturbed cantonment area, which has a low probability of containing intact cultural deposits.

LU 3.9.2 Airspace

LU 3.9.2.1 Airspace Affected Environment

The MOA, MTR, and range areas were used by Native Americans and European-American settlers. BMGR, 16 percent of which has been surveyed, contains evidence of human settlements dating to 9500 BC. This evidence includes prehistoric pottery, pictographs, and ancient trails. Approximately 1,275 archaeological sites have been recorded in 196,000 acres surveyed at BMGR (AETC 2009). The majority of the archaeological sites are associated with Native American use of the area spanning the past 12,000 years, including the Paleoindian, Archaic, Ceramic, and Protohistoric Periods. These include archaeological sites and features such as artifact scatters, roasting pits, hearths, cleared circles, geoglyphs, petroglyphs, rock shelters, trails, cairns, and shrines. Historic Period archaeological sites are also present and include abandoned mining operations, corrals, wells, tanks, ranch roads, gravesites, and a

historically significant road, the Camino del Diablo, which is listed in the NRHP. Sites from the Modern Period have also been recorded, including military training facilities dating back to World War II. Prehistoric and historic sites of similar types found in BMGR are expected to exist beneath the other Luke AFB training airspace units.

Table LU 3.9–1 presents the NRHP-listed sites and Indian Reservation lands under the various blocks of training airspace associated with Luke AFB. The Luke AFB training airspace overlies at least part of six counties in Arizona (Gila, La Paz, Maricopa, Pima, Pinal, and Yavapai) and portions of the Tohono O'odham Nation and the Fort Apache and San Carlos Apache Indian Reservations. Twenty NRHP-listed properties have been identified under Luke AFB primary use airspace (NRIS 2011). In addition, many more eligible and unevaluated but potentially eligible cultural resources associated with the history of the region are likely to underlie airspace, as the findings of the extensive survey of BMGR suggest. The White Mountain and San Carlos Apache, Tohono O'odham Nation, and Navajo Nation officially have assumed SHPO functions on their tribal lands, some of which underlie Luke AFB primary use airspace, and consultation with the Tribal Historic Preservation Officers did not identify additional NRHP-listed or -eligible properties within the APE, including any that should be considered eligible for inclusion on the NRHP for their traditional cultural value. Appendix C, Table C–11, contains the NRHP-listed resources under Luke AFB's primary use airspace identified for the F-35A.

At least two traditional cultural resources, one TCP, and one sacred site, have been identified under Luke AFB airspace (Rankin 2010). During the government-to-government consultation with tribes, the Hopi Tribe stated that they consider the prehistoric archaeological sites of their ancestors to be TCPs. The exact location of all traditional cultural resources, whether listed or eligible for listing in the NRHP or not, is confidential.

Table LU 3.9–1. NRHP-Listed Sites and Indian Reservation Lands Under Luke AFB Training Airspace

Airspace Designation	*Number of NRHP Properties Under Airspace*[1]	*Indian Reservation Lands Under Airspace*
Gladden and Bagdad MOA/ATCAA Complex	3	None
Sells MOA/ATCAA[2]	8	Tohono O'odham Nation
R-2301E Air-to-Air Area	2	None
BMGR – Tactical Ranges	2	None
VR-223	0	Tohono O'odham Nation
VR-231	0	None
VR-239	7	Fort Apache Reservation, San Carlos Reservation, Tohono O'odham Nation
VR-241	7	Tohono O'odham Nation
VR-242	2	None
VR-243	3	None
VR-244	6	Fort Apache Reservation, San Carlos Reservation, Tohono O'odham Nation
VR-245	0	None

[1] More-complete information concerning NRHP-listed properties, including property name and location (state, county, and nearest town), is found in Appendix C, Table C–11.
[2] A sacred site known to the Tohono O'odham Nation underlies this airspace.

Auxiliary Airfields

Gila Bend AFAF and Aux-1. Gila Bend AFAF and Aux-1 are proposed as the primary use auxiliary airfields for Luke AFB F-35A aircraft (see Figure LU 2.2–1). Cultural resource inventories of both auxiliary airfields have been completed. Isolated artifacts and Aux-1 and related features were determined not to be eligible for inclusion in the NRHP. Archaeological surveys of Gila Bend AFAF have identified 13 archaeological locales determined to be eligible for inclusion in the NRHP. An inventory of the built environment at Gila Bend AFAF identified a single Cold War era structure (built in 1970) that was not exceptionally significant but should be evaluated as it approaches 50 years old. No World War II or Cold War era buildings and structures are eligible for inclusion in the NRHP. A search of the National Register Information database indicated that there are no NRHP-listed properties at the two auxiliary airfields (NRIS 2011).

LU 3.9.2.2 Airspace Environmental Consequences

The training airspace used by the F-35A is common to all scenarios at Luke AFB – only the number of sorties changes as the number of aircraft bedded down changes.

Scenario L1. Under this scenario, 142 F-16 aircraft would be retired or relocated to other installations, and 24 F-35A aircraft would be bedded down at Luke AFB and would train in the primary use airspace described above and listed in Tables LU 2.2–1 and LU 2.2–2.

Projected airspace use under Scenario L1 would decrease from baseline conditions for all airspace associated with Luke AFB (see Tables LU 2.2–1 and LU 2.2–2). Subsonic noise would increase slightly beneath the Gladden and Bagdad MOA/ATCAA Complex and the BMGR South TAC Range; it would increase by 9 dB DNL_{mr} under the centerlines of VR-239 and VR-245 and by 2 dB DNL_{mr} under VR-223 and VR-231, but would remain below 65 dB DNL_{mr} under all airspace units. Supersonic events (sonic booms) are expected to decrease beneath all primary training airspace units.

No impacts on historic properties under airspace associated with Luke AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operations would be even less likely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-16, F-18, and A-10 aircraft has not impacted historic properties. Although there would be an increase in subsonic noise under some of the airspace units associated with Luke AFB, it would not be of sufficient magnitude to impact historic properties under airspace. F-35As will typically operate at higher altitudes than the legacy aircraft, and impacts on historic properties, including rock art, from noise or vibration are not expected. Flare and inert munitions use is not expected to impact historic properties under airspace. Existing use of flares by legacy aircraft is not known to have impacted these resources, and their use by F-35A aircraft also is not expected to result in impacts.

Native American Concerns. During the EIS public scoping process, the Air Force contacted the Ak-Chin Indian Community, Cocopah Tribe, Colorado River Indian Tribes, Fort McDowell Yavapai Nation, Fort Mojave Indian Tribe, Fort Yuma-Quechan Tribe, Gila River Indian Community, Hopi Tribe, Hualapai Tribe, Kaibab Band of Paiute Indians, Pueblo of Zuni Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Yavapai-Apache Nation, Yavapai-Prescott Indian Tribe, and the Tohono O'odham Nation to invite them to attend the public meetings and express their concerns about the potential F-35A beddown at Luke AFB. During the scoping process, including the public meetings, no comments regarding potential impacts on traditional resources or TCPs were received.

In accordance with Section 106 of the NHPA and Executive Order 13175, the Air Force also has contacted the Native American tribes listed in Appendix C to consult on a government-to-government basis regarding their concerns about potential impacts on traditional resources and TCPs under airspace associated with Luke AFB. After sending letters by mail, contacting the tribes by telephone and email, and briefing tribes at regularly scheduled meetings, the Air Force has received responses from nine tribes as of April 2012. The Tohono O'odham Nation expressed interest in the Air Force's action. The Gila River Indian Community expressed concern over aircraft crash and recovery procedures' potential to impact archaeological sites and deferred to the Tohono O'odham Nation as the lead in future consultations. The Fort Yuma-Quechan Tribe, Cocopah Tribe, and Ak-Chin Indian Community deferred comments to the Tohono O'odham Nation. The Hopi Tribe responded in writing that they consider prehistoric archaeological resources as TCPs, and that unless additional surveys identify prehistoric cultural resources or any are inadvertently discovered, they would defer further consultation on the proposed project to the State Historic Preservation offices and other interested tribes and parties. The Navajo Nation, Kaibab Band of Paiute Indians, Chemehuevi Tribe, and the Mescalero Apache Tribe indicated that they have no concerns regarding the Air Force proposal.

Portions of four Indian Reservations underlie primary airspace associated with Luke AFB: the White Mountain Apache Fort Apache Indian Reservation, San Carlos Indian Reservation, the Tohono O'odham Nation, and noncontiguous parcels of the Navajo Nation (Figure LU 2.2–1). TCPs, sacred sites, and other traditional resources are known to underlie this airspace.

The increase in subsonic noise under the Gladden and Bagdad MOA/ATCAA Complex, VR-239, VR-245, VR-223, VR-231, and the BMGR South TAC Range, as well as continued flare use, is not expected to result in impacts on traditional cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

Scenario L2. Under this scenario, 142 F-16 aircraft would be retired or relocated to other installations; 48 F-35A aircraft would be bedded down at Luke AFB and would train in the primary use airspace described above and listed in Tables LU 2.2–1 and LU 2.2–2. Projected airspace use under Scenario L2 would decrease from baseline conditions for all airspace associated with Luke AFB except VR-245 (see Tables LU 2.2–1 and LU 2.2–2). Subsonic noise would increase slightly beneath all airspace units associated with Luke AFB except MTRs VR-241, -242, -243, and -244, but would remain below 65 dB DNL_{mr} under all airspace units

except the BMGR North and South TAC Ranges. Supersonic events (sonic booms) are expected to decrease beneath all primary training airspace units.

As under Scenario L1, no impacts on historic properties under airspace associated with Luke AFB are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-16, F-18, and A-10 aircraft has not impacted historic properties, and the incremental increase in noise, as well as flare and inert munitions use, is not expected to impact historic properties under airspace.

Native American Concerns. Native American concerns and tribal lands overflown are the same as those identified under Scenario L1. Under Scenario L2, the increase in subsonic noise in most airspace units except MTRs VR-241, -242, -243, and -244 as well as continued flare use, is not expected to result in impacts on traditional cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

Scenario L3. Under this scenario, 142 F-16 aircraft would be retired or relocated to other installations, and 72 F-35A aircraft would be bedded down at Luke AFB and would train in the primary use airspace described above and listed in Tables LU 2.2–1 and LU 2.2–2. Airspace use would decrease from baseline conditions for all units except Gladden and Bagdad MOAs and VR-245. Noise would be slightly greater in Gladden, Bagdad, and Sells MOAs and BMGR North TAC Range, and MTRs VR-239, -245, -223, -231, and -244. Noise would exceed 65 DNL_{mr} in BMGR North, South, and East. As under the other scenarios, sonic booms would decrease in frequency.

Native American Concerns. Native American concerns and tribal lands overflown are the same as those identified under Scenario L1. Under Scenario L3, the increase in subsonic noise in all airspace units except MTRs VR-241, -242, and -243 as well as continued flare use, is not expected to result in impacts on traditional cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

Scenario L4. Under this scenario, 142 F-16 aircraft would be retired or relocated to other installations, and 96 F-35A aircraft would be bedded down at Luke AFB and would train in the primary use airspace described above and listed in Tables LU 2.2–1 and LU 2.2–2. Airspace use would decrease from baseline conditions for all units except Gladden/Bagdad MOA/ATCAA Complex and VR-245. DNL_{mr} would increase in all airspace units and exceed 65 DNL_{mr} in BMGR North, East, and South TAC Ranges. As with the other scenarios, sonic booms would decrease in frequency.

Like Scenario L1, no impacts on historic properties under airspace associated with Luke AFB are expected under this scenario.

Native American Concerns. Native American concerns and tribal lands overflown are the same as those identified under Scenario L1. Under Scenario L4, the increase in subsonic noise in all airspace units, as well as continued flare use, is not expected to result in impacts on traditional

cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

Scenario L5. Under this scenario, 142 F-16 aircraft would be retired or relocated to other installations, and 120 F-35A aircraft would be bedded down at Luke AFB and would train in the primary use airspace described above and listed in Tables LU 2.2–1 and LU 2.2–2. Airspace use would decrease from baseline conditions for all units except Gladden/Bagdad MOA/ATCAA Complex, and Sells MOAs/ATCAAs, and VR-239 and VR-245. Noise would be very similar to Scenario L4. DNL_{mr} would increase in all airspace units and would exceed 65 DNL_{mr} in BMGR North, South, and East TAC Ranges, as well as the R-2301E Air-to-Air area. As under the other scenarios, sonic booms would decrease in frequency from baseline conditions.

<u>Native American Concerns.</u> Native American concerns and tribal lands overflown are the same as those identified under Scenario L1. Under Scenario L5, the increase in subsonic noise in all airspace units, as well as continued flare use, is not expected to result in impacts on traditional cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

Scenario L6. Under this scenario, 142 F-16 aircraft would be retired or relocated to other installations, and 144 F-35A aircraft would be bedded down at Luke AFB and would train in the primary use airspace described above and listed in Tables LU 2.2–1 and LU 2.2–2.

Projected F-35A airspace use under Scenario L6 would increase over baseline conditions by about 22 percent in Sells MOA/ATCAA, 96 percent in the Gladden/Bagdad MOA/ATCAA Complex, 26 percent in the R-2301 Air-to-Air Area, 30 percent in VR-239, and 230 percent in VR-245. Operations would decrease by 5 to 31 percent in the BMGR relative to baseline conditions (see Tables LU 2.2–1 and LU 2.2–2). Subsonic noise would increase noticeably beneath all primary training airspace units, but would remain below 65 dB DNL_{mr} under all airspace units except the BMGR Tactical Ranges and Sells MOA/ATCAA, which would increase to as high as 70 dB DNL_{mr}. Supersonic events (sonic booms) are expected to decrease beneath all primary training airspace units.

As under the other scenarios, no impacts on historic properties under airspace associated with Luke AFB are expected under this scenario. Although there would be an increase in subsonic noise under some of the MOAs, MTRs, and restricted airspaces, it would not be of sufficient magnitude to impact historic properties under airspace. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Flare and inert munitions use is not expected to impact historic properties under airspace.

<u>Native American Concerns.</u> Native American concerns and tribal lands overflown are the same as those identified under Scenario L1. Under Scenario L6, the increase in subsonic noise in all airspace units, as well as continued flare use, is not expected to result in impacts on traditional cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

LU 3.10 Land Use and Recreation

LU 3.10.1 Base

LU 3.10.1.1 Base Affected Environment

Land Use

Regulatory Setting. The following information addresses Federal, state, and local statutes, regulations, programs, and plans that are relevant to the analysis of land use for Luke AFB. Because potential land use impacts are largely noise-related, the discussion of regulatory setting focuses on noise-related land use regulations and compatibility constraints.

AICUZ. Arizona state law and local zoning ordinances, rather than AICUZ guidelines, regulate noise-based constraints on land use surrounding military airports in Arizona. However, the AICUZ Program, through publication of periodic AICUZ studies, provides noise and accident potential data and related designations and analysis to assist the state and local jurisdictions with their planning. The *Luke Air Force Base Air Installation Compatible Use Zone Study* includes information on Arizona land use compatibility requirements (ARS 28-8481) applicable to areas in the vicinity of military airports, as well as Federal Interagency Committee on Urban Noise guidelines that apply to AFBs (Luke AFB 2003). Compatibility is expressed in terms of what types of land uses are acceptable or conditionally acceptable with NLR within designated APZs and Noise Zones (65–69 dB DNL, 70–74 dB DNL, etc.) CZs, APZs, and noise zones/noise contours are identified. Noise contours and/or safety zones in the vicinity of Luke AFB are located within Maricopa County and the cities of Glendale, Surprise, El Mirage, Goodyear, Buckeye, and, to a lesser extent, Litchfield Park and Youngtown.

Base General Plan. The land use plan component of the Luke AFB General Plan describes existing land use and guides the future development and land use decisions at Luke AFB (Luke AFB 2002). This document provides text, maps, plan graphics, and photographs and describes composite constraints and opportunities, infrastructure, land use, and capital improvements. General utility narrative and layout information is included.

Arizona Revised Statutes. Title 28, Article 7, "Airport Zoning & Regulation" (ARS 28-8480, 28-8481, and 28-8482), requires political subdivisions in "a territory in the vicinity of a military airport" to adopt land use plans and enforce zoning regulations that ensure development compatible with the high noise and accident potential generated by military airport operations. Within this territory, the law requires disclosure to property owners that they are within the territory of a military airport; the noise attenuation required for structures within the 65 dB noise contour applies to the entire area. In the case of Luke AFB, the territory is defined as 10 miles from the center of the runway to the north, west, and south, and 4 miles to the east.

A set of noise contours contained in a 1988 JLUS for Luke AFB were codified into law, thus stabilizing the area within which noise-based land use restrictions can occur (Luke AFB 2003). Within this territory, land use restrictions only apply within the 65 dB contour established by the 1988 JLUS. In addition, ARS 28-8461 defines a High Noise Zone for Luke AFB that includes APZ I and APZ II, plus the land area starting 200 feet from the south end of the westernmost runway at a width of 1,500 feet west and 2,500 feet east, measured perpendicular to the

centerline of the runway, and extending southwesterly parallel to the runway for a distance of 30,000 feet.

ARS 28-8481 (Arizona 2007) defines compatible land uses within the 65–69 dB, 70–74 dB, 75–79 dB, and 80 dB and higher DNL contours and the High Noise Zone. The ARS classifies a variety of land use types with regard to their compatibility with different noise intervals and APZs. A land use is either considered compatible with no restrictions, compatible with some restrictions (i.e., NLR would be required to achieve various decreases), or not compatible and should be prohibited. These land uses fall under the broad categories of transportation, communications, and utilities; commercial/retail trade; personal and business services; industrial/manufacturing; public and quasi-public services; outdoor recreation; and resource production, extraction, and open space.

The Western Maricopa County/Luke AFB Regional Compatibility Plan. This plan identifies land uses that are inconsistent with the compatibility criteria established by state legislation and provides compatibility information to be applied by local political jurisdictions with properties in the high hazard and noise zones associated with Luke AFB (ADC 2003). It contains a Compatible Land Use Plan that includes a map identifying seven separate "use zones" (CZ, APZ I, APZ II, and noise contours of 65, 70, 75, and 80 dB DNL), and lists compatible uses and "recommended intensity of use standards" for each zone. It also addresses inconsistencies within and between the AICUZ Program and state legislation and recommends implementation standards.

Local Regulations and Ordinances. Maricopa County and nine local political jurisdictions (City of Avondale, Town of Buckeye, City of El Mirage, City of Glendale, City of Goodyear, City of Litchfield Park, City of Peoria, City of Surprise, and Town of Youngtown) in the West Valley have regulations and ordinances that specifically address land use and zoning issues in the territory in the vicinity of Luke AFB, including zoning, military airport zoning, airport impact and noise overlay districts, notification areas, building code insulation (noise attenuation), and navigational easements. The specific regulations and ordinances are contained in the general plans, comprehensive plans, and zoning ordinances of these jurisdictions.

On-Base Land Use. Luke AFB is located in Maricopa County, within the city limits of Glendale, Arizona, in the West Valley of the Phoenix metropolitan area. Luke AFB includes approximately 2,772 acres of fee land plus easements. Most of the cantonment area is located to the east of the airfield/runway/apron system. The cantonment area includes an operations area, open space, and industrial use to the northwest; administrative, community, unaccompanied housing, industrial, and operations areas to the east; operations and industrial areas to the south; and the airfield in the center (Luke AFB 2002).

Industrial activities occur throughout the cantonment area, located west of Litchfield Road, while large parking areas and open recreation areas occur along the entry corridor and around dormitory complexes. Consolidated areas of administrative, commercial, and unaccompanied housing make up the remainder of this area (Luke AFB 2002).

The shopping center, medical facility, and community administration building are located along the east side of Litchfield Road. Family housing is located east of these facilities along the north and south sides of Glendale Avenue. A waste annex is located along Glendale Avenue,

approximately 1 mile east of the family housing area. The northwestern portion of the base includes a detention pond and golf course (Luke AFB 2002).

Luke AFB has extensive operations/training, logistics/support systems, infrastructure, and community facilities (i.e., Military Family Housing and dormitories) for the F-16. Areas dedicated for training of allied forces are also present on the installation.

Surrounding Land Use. Luke AFB is located within the city of Glendale, but most of the surrounding land is within Maricopa County, the planning entity for the unincorporated areas. Communities within the West Valley are in transition from rural and agricultural areas to urban and suburban uses. The area has recently experienced rapid growth in single-family residential development and associated commercial and service-related uses (ADC 2003). For the most part, however, undeveloped areas, agricultural land, and low-density development surround the base.

Section LU 3.10.1.2, Figure LU 3.10–2 displays existing land uses surrounding Luke AFB along with baseline noise contours. The area north of Luke AFB includes mainly open/agricultural/transportation land use interspersed with residential, commercial, and public/quasi-public uses. Residential, commercial, open/agricultural/transportation, and public/quasi-public uses occur to the east. Immediately south of Luke AFB are open/agricultural/transportation, recreation, and commercial land uses, beyond which land use is mainly residential. Surrounding the western portion of the base is open/agricultural/transportation interspersed with some residential and commercial uses.

Land use activities most sensitive to noise typically include residential, institutional/quasi-public (e.g., school, place of worship, or hospital), and areas associated with cultural and recreational uses. The predominant land use within the Luke AFB 65 dB DNL or greater baseline noise contours is open, followed by public/quasi-public, residential, recreational uses and some commercial and industrial uses (see Table LU 3.10–1).

Table LU 3.10–1. Off-Base Land Uses within the Luke AFB 65 dB DNL and Greater Noise Contours, Baseline Conditions

Contour Interval (dB DNL)	***Land Use (acres)***						
	Commercial	**Industrial**	**Open**	**Public/Quasi-Public**	**Recreational**	**Residential**	**Total Area Affected**
65–69	4	26	3,015	485	116	258	3,904
70–74	55	30	1,881	5	83	53	2,107
75–79	80	1	712	19	30	16	859
80–84	12	0	157	0	3	0	173
≥ 85	0	0	0	0	0	0	0
Total Area	**151**	**57**	**5,765**	**509**	**232**	**327**	**7,042**

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acres are displayed as whole numbers in the text and tables, whereas calculations are based on raw [GIS] acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Noise Contours: Luke AFB 2007a; Land Use Data: Maricopa County Assessor's Office 2009.

Figure LU 3.10–1 displays the 65 dB DNL and greater JLUS contours for Luke AFB. The 65 dB DNL JLUS contour bounds the area within which state-mandated, locally adopted land use compatibility controls apply. The predominant land use within the 1988 JLUS noise contours is open, followed by residential, public/quasi-public uses and some commercial, industrial, and recreational uses (see Table LU 3.10–2). Approximately 132 acres (102 acres of open land uses and 30 acres of residential land uses) under the baseline 65–69 dB DNL noise contour fall outside of the 65 dB DNL JLUS noise contour.

Table LU 3.10–2. Off-Base Land Uses within the Luke AFB 65 dB DNL and Greater Noise Contours, 1988 JLUS

Contour Interval (dB DNL)	***Land Use (acres)***						
	Commercial	**Industrial**	**Open**	**Public/Quasi-Public**	**Recreational**	**Residential**	**Total Area Affected**
65–69	242	365	5,755	875	116	1,569	8,922
70–74	75	140	4,330	437	161	549	5,692
75–79	123	15	2,068	148	53	249	2,656
80–84	151	56	1,798	47	39	100	2,191
Total Area	**591**	**576**	**13,951**	**1,507**	**369**	**2,467**	**19,461**

Note: Published 1988 JLUS contours do not include 85 DNL contour line.
Source: Noise Contours: Luke AFB Geo Integration Office 2002; Land Use Data: Maricopa County Assessor's Office 2009.

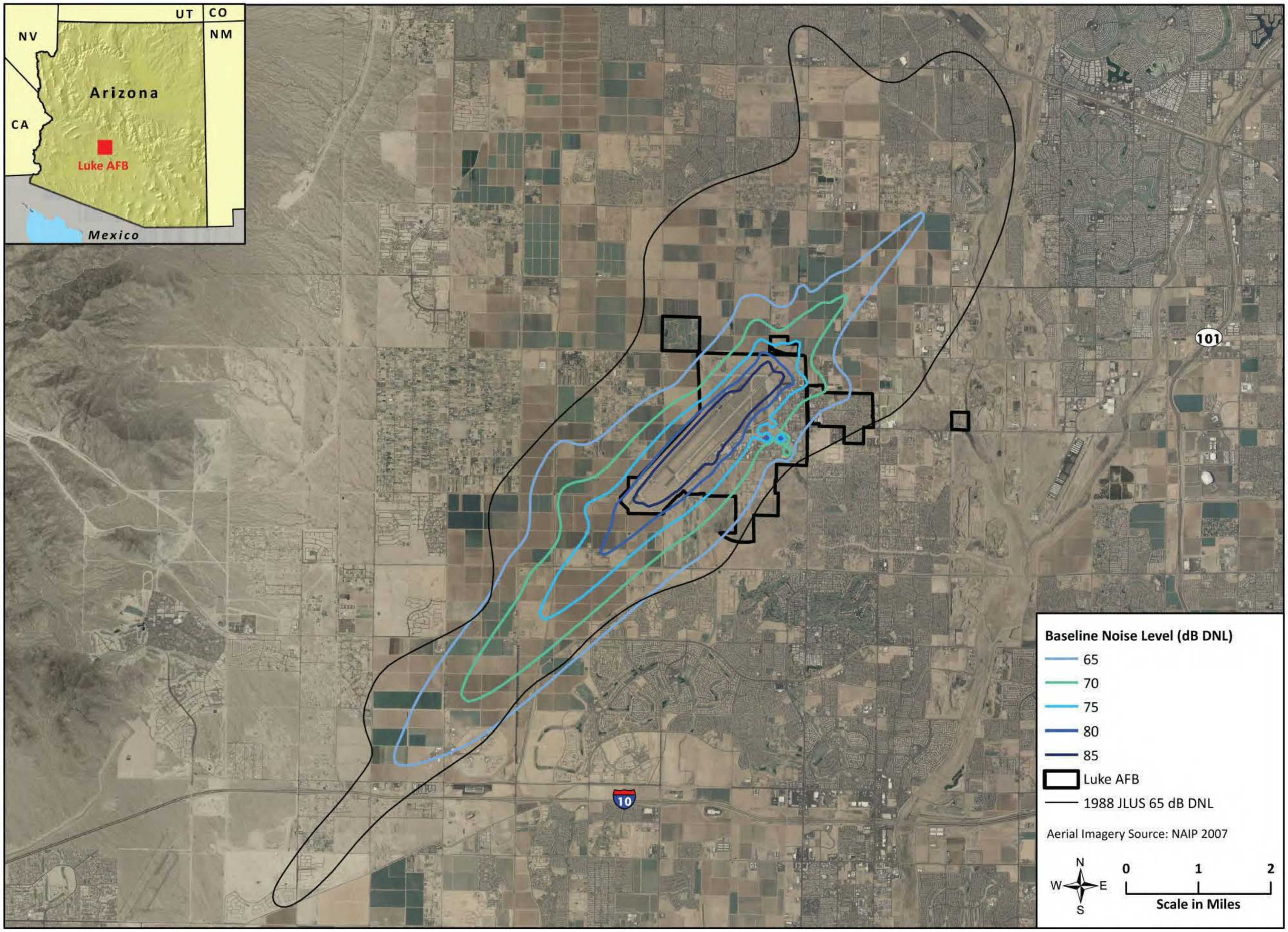


Figure LU 3.10–1. Luke AFB JLUS and Baseline Noise Contours

Recreation

Outdoor recreation on Luke AFB includes a golf course to the northwest of the runway, ball fields to the east of the cantonment, and interspersed open areas for informal outdoor activities. Surrounding the base, several golf courses, parks, and country clubs and some commercial ventures provide recreational amenities, mostly for residents in West Valley suburbs of Phoenix. Table LU 3.10–3 lists public and commercial/private recreational facilities located around Luke AFB. Specifically, to the northeast are the Pueblo Country Club, Dysart High School (with ball fields and outdoor facilities for physical education), Gateway Park, and Bill Gentry Park. To the west of the airfield is a commercial venture, the Wildlife World Zoo. To the south and southeast are Wigwam Country Club, Tuscany Falls Golf Course, and Pebble Creek Golf Resort. Falcon Golf Club and a car racing track are located directly adjacent to the base on the south side of the airfield. About 7 miles to the west, White Tank Mountain Regional Park offers open space and a quieter and more natural setting for outdoor activities (such as walking, jogging, picnicking, and nature viewing).

Table LU 3.10–3. Recreational Amenities Around Luke AFB

Recreation Amenity	Activities	Current Noise Level (dB)	Compatibility (Y/N)
Bill Gentry Park	Ball fields, ball courts, playground	< 65	Y
Country Meadows Golf Course	Golf	< 65	Y
Dysart High School	Ball fields and courts	< 65	Y
Falcon Golf Club	Golf	65–80	Y
Falcon Dunes Golf Course	Golf	< 65	Y
Gateway Park	Skate plaza, ball courts, playing fields, playground, amphitheater, concessions, picnicking	< 65	Y
North Golf Course	Golf	< 65	Y
Pebble Creek Golf Resort	Golf	< 65	Y
Pueblo Country Club	Golf, tennis, swimming, indoor dining and gathering areas	< 65	Y
South Golf Course	Golf	< 65	Y
Speedway Course	Speed racing - cars	65–82	Y[1]
Sun City Country Club	Golf, tennis, swimming, indoor dining and gathering areas	< 65	Y
Tuscany Falls Golf Course	Golf	< 65	Y
White Tank Mountain Regional Park	Hiking, biking	< 65	Y
Wigwam Country Club	Golf, tennis, swimming	< 65	Y
Wildlife World Zoo	Wildlife viewing, family outings	< 65	Y

[1] Elevated noise levels from cumulative operations at Luke AFB and the adjacent speedway may be incompatible for spectators. However, spectator exposure would be intermittent and limited in duration for specific events.

LU 3.10.1.2 Base Environmental Consequences

Land Use

Scenario L1. The F-35A beddown of training aircraft under Scenario L1 would require construction and modification of facilities within Luke AFB (see Table LU 2.1–2). The construction, demolition, and renovation of facilities would take place within the previously disturbed cantonment area of Luke AFB. No additional construction is projected in any locations outside the installation. Although the specific location of projected facilities is not yet known, the land uses on the installation are characteristic of a military airfield. New facilities would be designed and sited to be consistent with the base master plan, airfield safety guidelines, and related planning programs to ensure that projected development associated with F-35A training would be compatible with surrounding land uses. Land use impacts on surrounding communities during construction are expected to be minimal because proposed development would be contained within existing military designations at Luke AFB. In addition, traffic, noise, dust, and similar effects from construction equipment and vehicles would be reduced through construction plans and practices agreed to by contractors.

A discussion of projected on-base noise levels under Scenario L1 is presented in Section LU 3.2. As summarized in Table LU 3.10–4, activities under Scenario L1 would decrease the area surrounding Luke AFB within the 65 dB DNL or greater noise contour by approximately 2,278 acres compared with baseline conditions. This would result in a decrease of approximately 1,401 off-installation residents affected by the 65 dB DNL or greater noise contours compared with the baseline.

Overall, acreage of commercial and industrial land uses under the 65 dB DNL or greater noise contours would increase while open, public/quasi-public, recreational and residential uses would decrease. The largest decrease in acreage would be open areas, followed by public/quasi-public, recreational, and other uses (see Figure LU 3.10–2).

Under this scenario, some land uses exposed to noise would show a decrease in total acreage compared with the baseline, while others would increase (see Figure LU 3.10–2). For example, the acreage of commercial and industrial land uses within the 65 to 70 dB DNL contour would increase compared with the baseline, whereas the acreage of open, public/quasi-public, recreational, and residential land uses would decrease.

Comparing the baseline noise contours with those projected under Scenario L1, there would be areas of shifted exposure surrounding Luke AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). The areas that would no longer be located under the 65 dB DNL or greater baseline contours are primarily to the west and southwest of the airstrip and include primarily open and public/quasi-public land uses with some residential, recreational, industrial, and commercial use. No areas outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels greater than 65 dB DNL under Scenario L1.

Table LU 3.10–4. Off-Base Land Uses within the Luke AFB 65 dB DNL and Greater Noise Contours, F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Generalized Land Use (Off-Installation/Airport)*													
	Commercial		Industrial		Open		Public/ Quasi-Public		Recreational		Residential		Total Area Affected	
	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change
Scenario L1 (24 Aircraft)														
65–69	84	80	56	31	2,561	(454)	140	(345)	90	(26)	243	(16)	3,173	(730)
70–74	89	34	11	(19)	1,123	(757)	12	8	35	(48)	39	(14)	1,309	(798)
75–79	8	(72)	1	0	266	(446)	0	(19)	1	(29)	2	(14)	278	(580)
80–84	0	(12)	0	0	2	(155)	0	0	0	(3)	0	0	2	(170)
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**181**	**30**	**68**	**12**	**3,952**	**(1,812)**	**152**	**(356)**	**126**	**(106)**	**284**	**(44)**	**4,762**	**(2,278)**
Scenario L2 (48 Aircraft)														
65–69	136	132	53	28	3,277	262	162	(323)	126	10	323	65	4,078	175
70–74	101	46	31	1	1,440	(441)	52	47	50	(33)	71	18	1,744	(363)
75–79	29	(51)	1	(1)	517	(195)	0	(19)	7	(24)	8	(8)	561	(297)
80–84	0	(12)	0	1	23	(134)	0	0	0	(3)	0	0	23	(149)
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**266**	**115**	**85**	**29**	**5,257**	**(508)**	**214**	**(295)**	**183**	**(50)**	**402**	**75**	**6,406**	**(634)**
Scenario L3 (72 Aircraft)														
65–69	158	154	55	30	3,953	938	132	(353)	154	38	450	192	4,903	1,000
70–74	101	46	45	15	1,724	(157)	91	86	65	(18)	109	56	2,135	28
75–79	48	(32)	1	0	717	6	0	(19)	17	(14)	15	(1)	799	(60)
80–84	2	(10)	0	1	76	(82)	0	0	0	(3)	0	0	77	(94)
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**309**	**158**	**101**	**46**	**6,470**	**705**	**223**	**(286)**	**236**	**3**	**574**	**247**	**7,914**	**874**

Contour Interval (dB DNL)	Generalized Land Use (Off-Installation/Airport)													
	Commercial		Industrial		Open		Public/ Quasi-Public		Recreational		Residential		Total Area Affected	
	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change	Acres	Change
Scenario L4 (96 Aircraft)														
65–69	156	152	89	64	4,595	1,580	106	(379)	167	51	636	378	5,749	1,846
70–74	97	42	46	16	2,000	120	120	115	81	(2)	143	91	2,488	381
75–79	72	(8)	1	0	884	172	1	(18)	27	(3)	24	8	1,010	151
80–84	5	(8)	1	1	144	(13)	0	0	0	(2)	1	1	150	(21)
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**330**	**178**	**137**	**81**	**7,623**	**1,859**	**227**	**(282)**	**275**	**44**	**804**	**478**	**9,397**	**2,357**
Scenario L5 (120 Aircraft)														
65–69	155	151	150	125	5,051	2,036	93	(392)	193	77	779	521	6,420	2,517
70–74	104	49	45	14	2,261	381	141	136	94	11	170	117	2,816	708
75–79	87	7	3	2	1,039	327	8	(11)	35	5	31	15	1,203	344
80–84	8	(5)	1	1	224	66	0	0	1	(2)	2	3	234	64
≥ 85	0	0	0	0	2	2	0	0	0	0	0	0	2	3
Total ≥ 65	**354**	**202**	**199**	**142**	**8,577**	**2,812**	**242**	**(267)**	**323**	**91**	**982**	**656**	**10,675**	**3,636**
Scenario L6 (144 Aircraft)														
65–69	154	150	180	155	5,259	2,243	101	(384)	204	88	895	637	6,793	2,890
70–74	122	67	43	12	2,525	644	150	145	107	24	209	156	3,154	1,047
75–79	95	15	13	11	1,162	450	21	1	40	10	37	21	1,367	508
80–84	13	0	1	1	310	152	0	0	3	0	6	5	330	159
≥ 85	0	0	1	0	1	4	0	0	0	0	0	0	2	4
Total ≥ 65	**384**	**232**	**238**	**179**	**9,257**	**3,493**	**272**	**(238)**	**354**	**122**	**1,147**	**819**	**11,646**	**4,608**

Note: (Number) denotes a negative number. Numbers may not sum due to rounding.
Source: Land Use Data. Maricopa County Assessor's Office 2009.

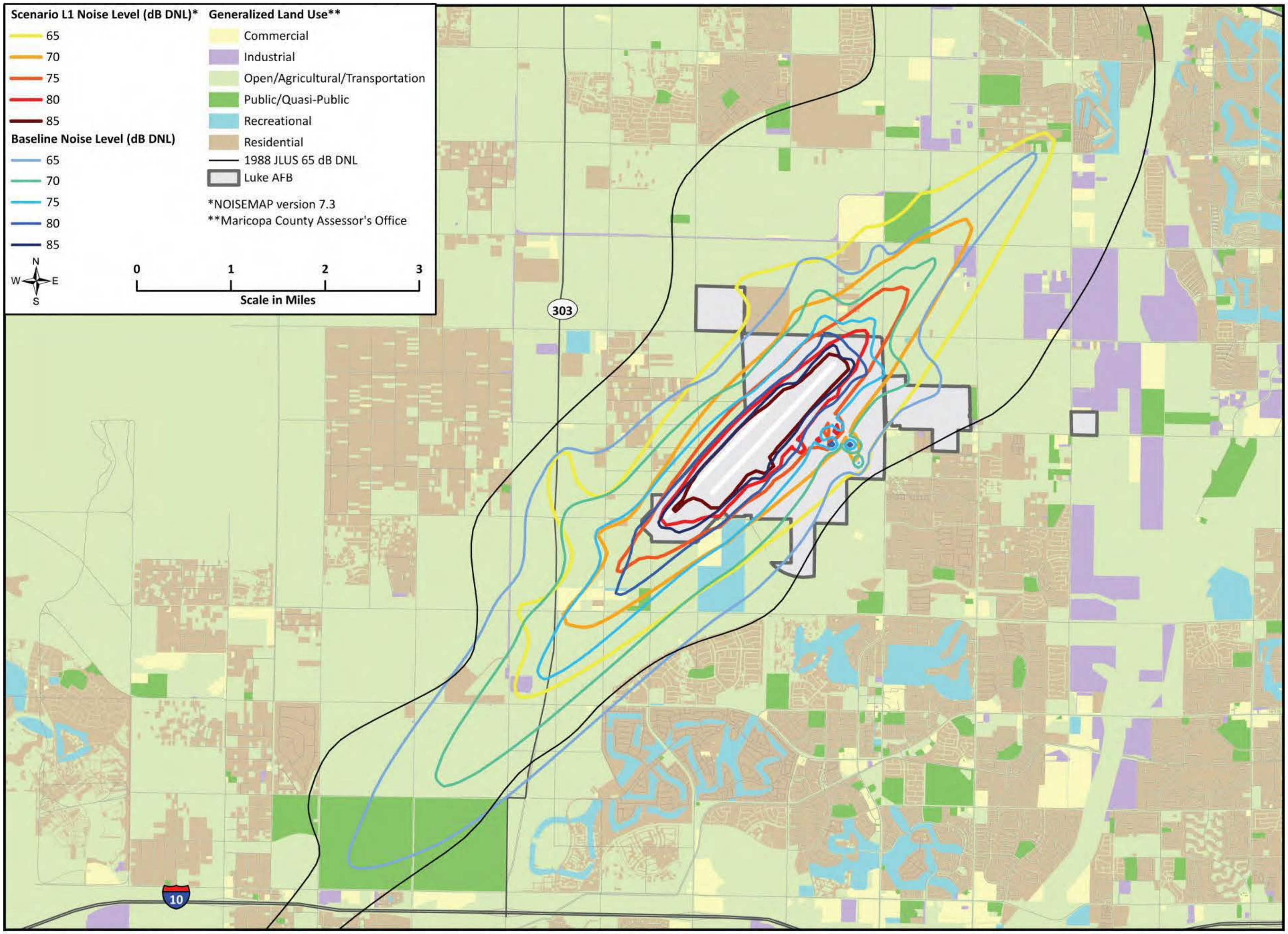


Figure LU 3.10–2. Scenario L1 and Baseline Land Use and Noise Contours in Areas Surrounding Luke AFB

Scenario L2. The F-35A beddown of training aircraft under Scenario L2 would include incrementally more construction and modification of facilities on Luke AFB than Scenario L1, given the increase in aircraft and operations (see Table LU 2.1–2).

A discussion of projected on-base noise levels under Scenario L2 is presented in Section LU 3.2. As summarized in Table LU 3.10–4, activities under Scenario L2 would decrease the area surrounding Luke AFB within the 65 dB DNL or greater noise contour by approximately 635 acres compared with baseline conditions. Under this scenario, while some land uses exposed to noise greater than 65 dB DNL would decrease in total acreage, other areas would increase compared with the baseline (see Table LU 3.10–4 and Figure LU 3.10–3). For example, the acreage of commercial, industrial, open, recreational, and residential land uses within the 65 to 69 dB contour would increase, while public/quasi-public land use would decrease. The largest increase in acreage would be for commercial land use, followed by residential, then other uses. As a result, the estimated number of off-installation residents affected by projected noise levels greater than 65 dB DNL would be 487, a decrease of 1,113.

Comparing the baseline noise contours with those projected under Scenario L2, there would be areas of shifted exposure surrounding Luke AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the existing contours that would be newly affected). No areas outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels greater than 65 dB DNL under Scenario L2.

Scenario L3. The F-35A beddown of training aircraft under Scenario L3 would include incrementally more construction and modification of facilities on Luke AFB than Scenario L2, given the increase in aircraft and operations (see Table LU 2.1–2). A discussion of projected on-base noise levels under Scenario L3 is presented in Section LU 3.2.

Activities under Scenario L3 would increase the area surrounding Luke AFB within the 65 dB DNL or greater noise contour by approximately 874 acres compared with baseline conditions. The estimated number of persons affected by noise levels greater than 65 dB DNL would be 1,181, a decrease of 420. The largest increase in acreage would be open areas, followed by residential, then other uses.

Although a change in total land area and/or type of land use can influence population density, data on type of land use provided by Maricopa County are reported at a more-generalized level, whereas the estimate of population exposed to various noise levels done for this analysis is based on a detailed, block-level GIS analysis using 2010 census data. The census data is considered to be the most detailed, recent, and reliable data available to analyze potential population effects. Similarly, an increase in total land area and/or an increase in acres of residential land use within the 65 dB and greater noise contour may not necessarily correspond to a population increase given the various factors involved. Likewise, a decrease in land area or residential land use may not correspond to a population decrease.

Under this scenario, some land uses exposed to noise would decrease in total acreage while other areas would increase, depending on the contour (see Figure LU 3.10–4). For example, the acreage of commercial, industrial, open, recreational, and residential land uses within the 65 to 69 dB DNL contour would increase, while the acreage of public/quasi-public land uses would decrease (see Table LU 3.10–4).

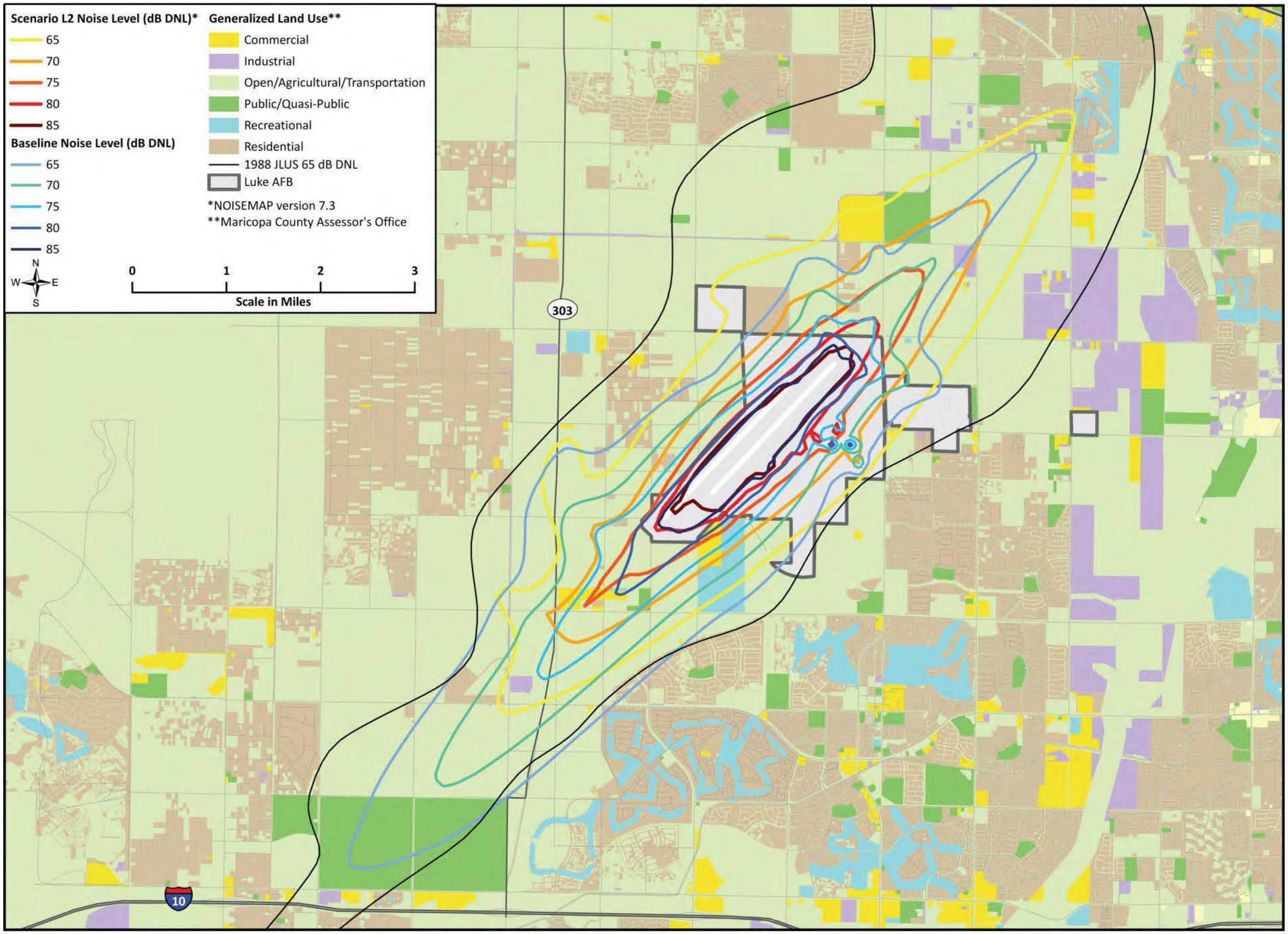


Figure LU 3.10–3. Scenario L2 and Baseline Land Use and Noise Contours in Areas Surrounding Luke AFB

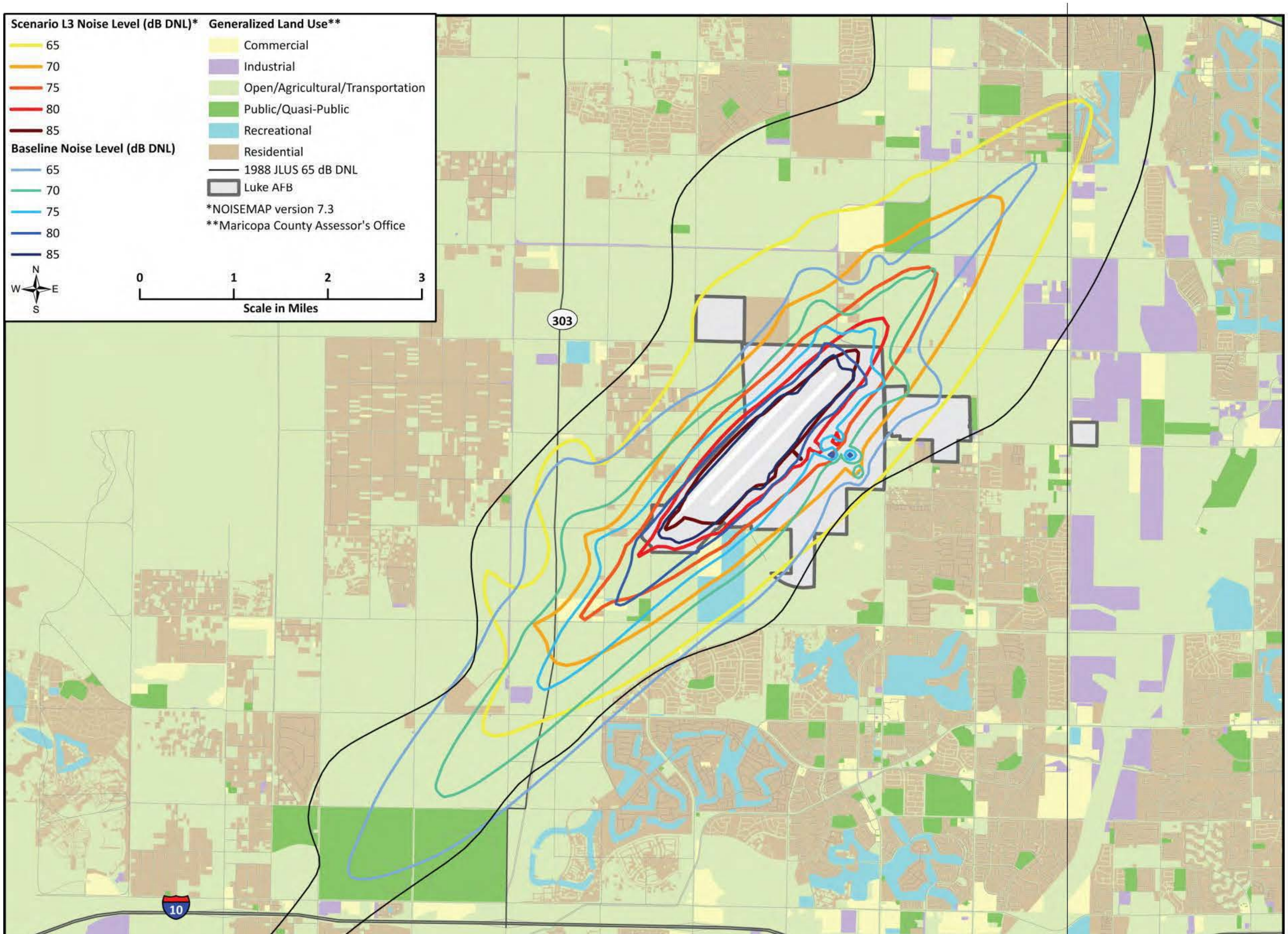


Figure LU 3.10–4. Scenario L3 and Baseline Land Use and Noise Contours in Areas Surrounding Luke AFB

Comparing the baseline noise contours with those projected under Scenario L3, there would be areas of shifted exposure surrounding Luke AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). A total of approximately 7 acres of open land use outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L3.

Scenario L4. The F-35A beddown of training aircraft under Scenario L4 would include incrementally more construction and modification of facilities on Luke AFB than Scenario L3, given the increase in aircraft and operations (see Table LU 2.1–2). A discussion of projected on-base noise levels under Scenario L4 is presented in Section LU 3.2.

Activities under Scenario L4 would increase the area surrounding Luke AFB within the 65 dB DNL or greater noise contour by approximately 2,357 acres compared with baseline conditions. The estimated number of persons affected by the projected increase in noise would be 2,223, an increase of 623. The largest increase in acreage would be open, followed by residential, then other uses (see Table LU 3.10–4).

Under this scenario, some land uses exposed to noise would decrease in total acreage while other areas would increase, depending on the contour (see Figure LU 3.10–5). For example, the acreage of commercial, industrial, open, recreational, and residential land uses within the 65 to 69 dB DNL contour would increase, while the acreage of public/quasi-public land uses would decrease (see Table LU 3.10–4).

Comparing the baseline noise contours with those projected under Scenario L4, there would be areas of shifted exposure surrounding Luke AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). A total of approximately 34 acres (30 acres of open and 4 acres of residential land uses) outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L4.

Scenario L5. The F-35A beddown of training aircraft under Scenario L5 would include incrementally more construction and modification of facilities on Luke AFB than Scenario L4, given the increase in aircraft and operations (see Table LU 2.1–2). A discussion of projected on-base noise levels under Scenario L5 is presented in Section LU 3.2.

Activities under Scenario L5 would increase the area surrounding Luke AFB within the 65 dB DNL or greater noise contour by approximately 3,636 acres compared with baseline conditions. The estimated number of persons affected by the projected increase in noise would be 3,215, an increase of 1,615. The largest increase in acreage would be open areas, followed by residential, then other uses (see Table LU 3.10–4).

Under this scenario, some land uses exposed to noise would decrease in total acreage, while other areas would increase, depending on the contour (see Figure LU 3.10–6). For example, the acreage of commercial, industrial, open, recreational, and residential land uses within the 65 to 69 dB contour would increase, while the acreage of public/quasi-public land uses would decrease.

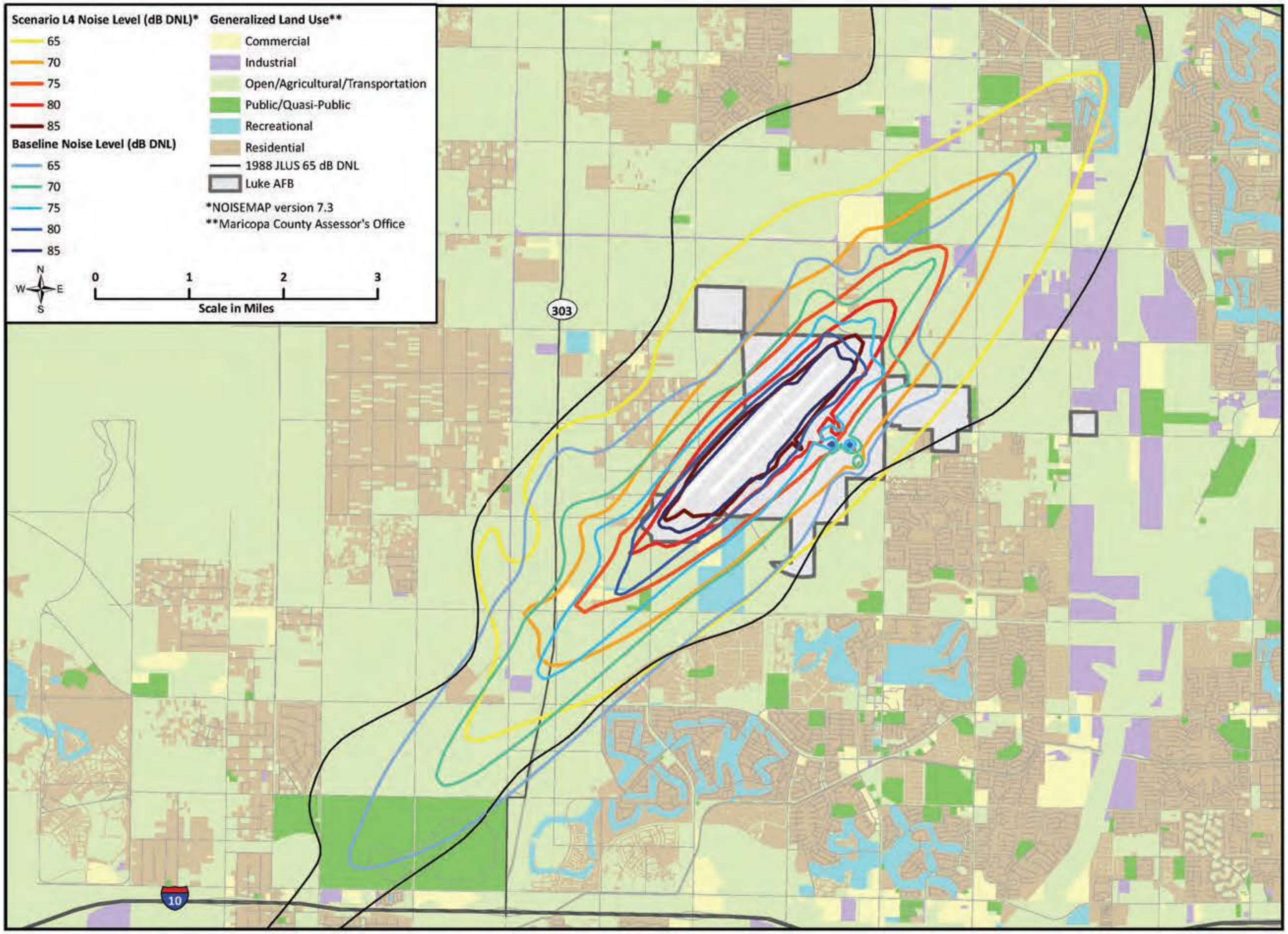


Figure LU 3.10–5. Scenario L4 and Baseline Land Use and Noise Contours in Areas Surrounding Luke AFB

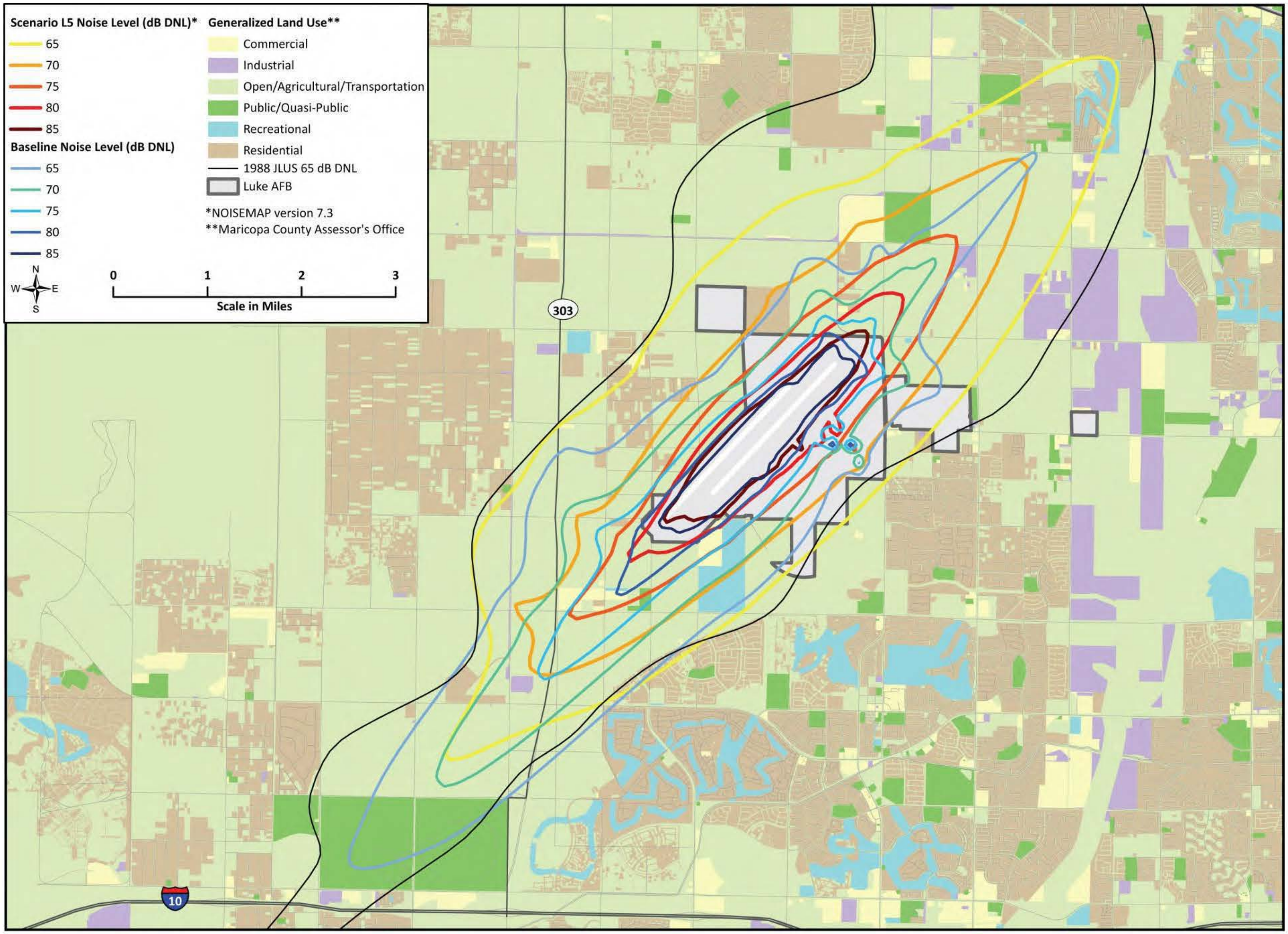


Figure LU 3.10–6. Scenario L5 and Baseline Land Use and Noise Contours in Areas Surrounding Luke AFB

Comparing the baseline noise contours with those projected under Scenario L5, there would be areas of shifted exposure surrounding Luke AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). A total of approximately 117 acres (81 acres of open and 36 acres of residential land uses) outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L5.

Scenario L6. The F-35A beddown of training aircraft under Scenario L6 would include incrementally more construction and modification of facilities on Luke AFB than Scenario L5, given the increase in aircraft and operations (see Table LU 2.1–2). A discussion of projected on-base noise levels under Scenario L6 is presented in Section LU 3.2.

Activities under Scenario L6 would increase the area surrounding Luke AFB within the 65 dB DNL or greater noise contour by approximately 4,609 acres compared with baseline conditions. The estimated number of persons affected by the projected increase in noise would be 5,341, an increase of 3,740. The largest increase in acreage would be open, followed by residential, then other uses (see Table LU 3.10–4).

Under this scenario, some land uses exposed to noise would decrease in total acreage while other areas would increase, depending on the contour (see Table LU 3.10–4 and Figure LU 3.10–7). For example, the acreage of commercial, industrial, open, recreational, and residential land uses within the 65 to 69 dB DNL contour would increase, while the acreage of public/quasi-public land uses would decrease (see Table LU 3.10–4).

Comparing the baseline noise contours with those projected under Scenario L6, there would be areas of shifted exposure surrounding Luke AFB (i.e., land currently within the existing contours that would no longer be affected and areas outside the contours that would be newly affected). A total of approximately 252 acres (174 acres of open and 78 acres of residential land uses) outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L6.

Recreation

Scenario L1. Construction for the F-35A would take place on the east side of the airfield within the existing cantonment. These areas are sufficiently far from surrounding recreational sites that no direct impacts would result. During construction, the loudest tasks, such as jack hammering of concrete may be audible at nearby golf courses, but these would be intermittent and not at levels that would interfere with recreational activities.

Under Scenario L1, a reduction of about 1,278 personnel and dependents would have no negative effect on the quality of recreational amenities in the area. Some beneficial impact on commercial recreational businesses may result.

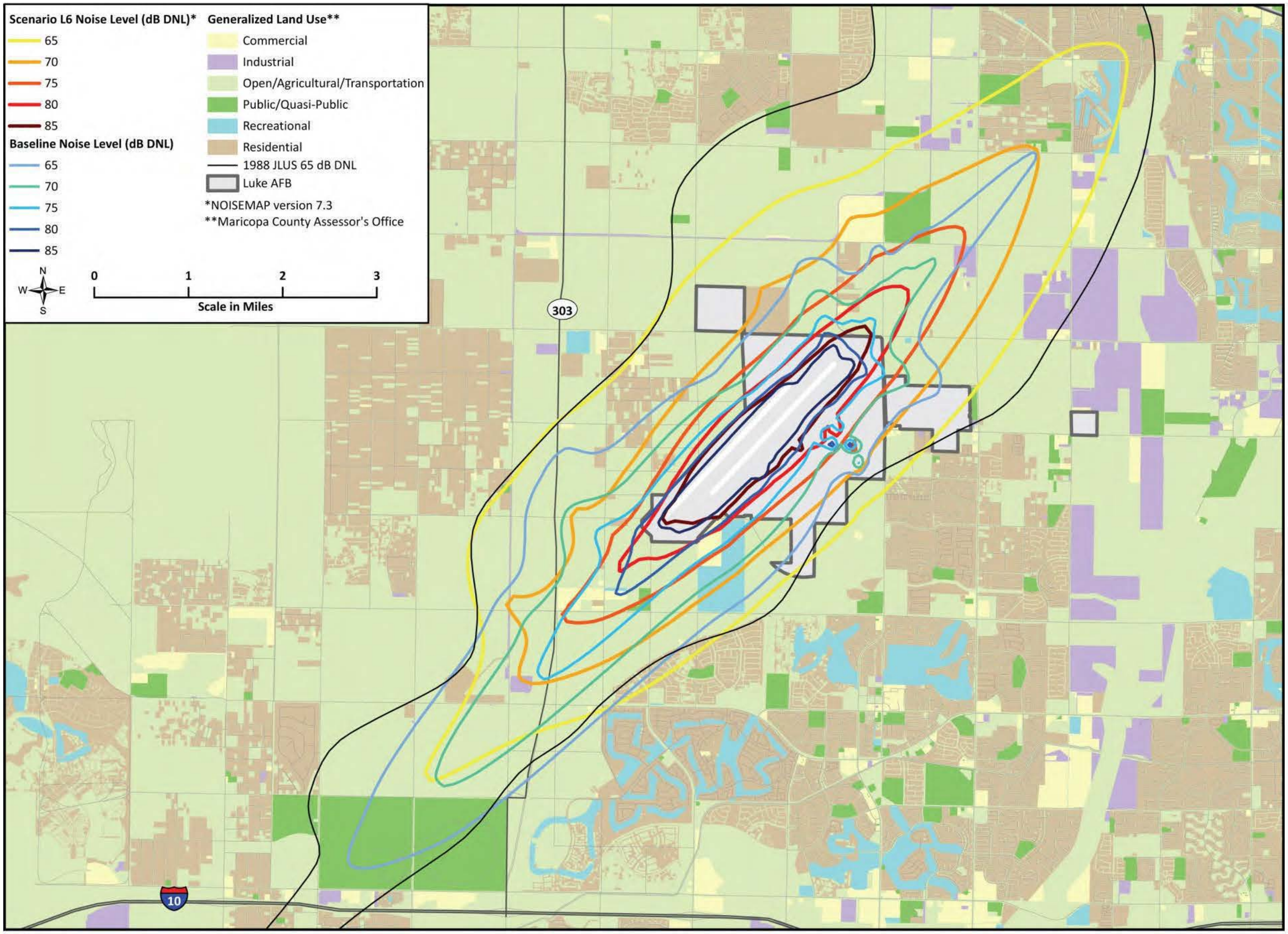


Figure LU 3.10–7. Scenario L6 and Baseline Land Use and Noise Contours in Areas Surrounding Luke AFB

Noise levels would decrease slightly at all recreational locations in the areas immediate surrounding the airfield under Scenario L1. Table LU 3.10–5 lists recreational sites in the area surrounding the airfield and provides current and projected average noise levels for each location. A minor increase in noise exposure on the west side would bring a small portion of the Falcon Dunes Golf Course fairways within the area affected by noise levels of 65 dB DNL. Falcon Golf Club, adjacent to Luke AFB on the south, currently experiences noise levels between 65 and 80 dB DNL on fairways and about 70 dB DNL at the clubhouse. Under Scenario L1, noise levels would be lower on the fairways than current levels and at the clubhouse (about 65 dB DNL). Similarly, the adjacent speedway would experience slightly lower noise levels than under current conditions.

Table LU 3.10–5. Noise Effects on Recreational Amenities Around Luke AFB

Recreational Amenity	***Average Noise Level (dB DNL)***						
	Baseline Conditions	**Scenario L1 (24 Aircraft)**	**Scenario L2 (48 Aircraft)**	**Scenario L3 (72 Aircraft)**	**Scenario L4 (96 Aircraft)**	**Scenario L5 (120 Aircraft)**	**Scenario L6 (144 Aircraft)**
Bill Gentry Park	< 65	< 65	< 65	< 65	< 65	< 65	< 65
Country Meadows Golf Course	< 65	< 65	< 65	< 65	< 65	< 65	< 65
Dysart High School	< 65	< 65	< 65	< 65	< 65	< 65	65–70
Falcon Golf Club[1]	65–80	65–80	65–80	65–80	65–80	65–80	65–82
Falcon Dunes Golf Course[2]	< 65	65–70	65–70	65–70	65–70	65–70	65–71
Gateway Park[3]	< 65	< 65	65–70	65–70	65–70	65–70	65–70
North Golf Course	< 65	< 65	< 65	< 65	< 65	< 65	< 65
Pebble Creek Golf Resort	< 65	< 65	< 65	< 65	< 65	< 65	< 65
Pueblo Country Club[4]	< 65	< 65	< 65	65–70	65–70	65–70	65–70
South Golf Course	< 65	< 65	< 65	< 65	< 65	< 65	< 65
Speedway Course[5]	65–82	65–80	65–81	65–81	65–82	65–83	65–84
Sun City Country Club	< 65	< 65	< 65	< 65	< 65	< 65	< 65
Tuscany Falls Golf Course	< 65	< 65	< 65	< 65	< 65	< 65	< 65
White Tank Mountain Regional Park	< 65	< 65	< 65	< 65	< 65	< 65	< 65
Wigwam Country Club	< 65	< 65	< 65	< 65	< 65	< 65	< 65
Wildlife World Zoo	< 65	< 65	< 65	< 65	< 65	< 65	< 65

1 Noise contours decrease from northwest to southeast of the parcel; areas in northwest of golf course fall under higher noise contours (up to 80 dB DNL) and areas in the southeast fall under lower contours (65 dB DNL). Clubhouse in center of the parcel exposed to 70 dB DNL under baseline conditions, lower levels under Scenarios L1 and L2, and slightly higher levels under Scenarios L5 and L6.

2 Under Scenario L6, a portion of the southeastern corner of the parcel falls under the 70–75 dB DNL contour, including the clubhouse, and increasing portions of the fairways fall under the 65–70 dB DNL contour. Under Scenarios L4, L5, and L6, the golf course falls completely under the 65–70 dB DNL contour. Under Scenarios L2 and L3, a portion falls under the 65–70 dB DNL contour and the remainder of the area falls under < 65 dB DNL conditions. Only a small portion of the fairways falls within the 65–70 dB DNL contour under Scenario L1.

3 The western portion of Gateway Park is exposed to 65 to 70 dB DNL noise levels under Scenarios L2 and L3. The entire park is within the 65–70 dB DNL contour under Scenarios L4, L5, and L6.

4 Portions of the Pueblo Country Club and fairways fall under the 65–70 dB DNL noise contour (progressively larger portion from about 20 up to 100 percent under Scenarios L3, L4, L5, and L6).

5 The speedway race track adjacent to Luke AFB and Falcon Golf Club experience elevated noise levels. These would be somewhat lower than current conditions under Scenarios L1, L2, and L3; about the same as under Scenario L4; and slightly higher than under Scenarios L5 and L6.

Scenario L2. Impacts from construction on recreational sites surrounding the airfield would be the same as those under Scenario L1. A slight increase in personnel and dependents of about 385 would have no impact on recreational amenities in the local area.

Noise exposure and effects on recreational amenities would increase slightly, but would remain below current levels on the east and south side of the airfield and slightly above current levels on the north and west side. Noise levels at the Falcon Golf Club clubhouse and fairways and adjacent speedway would remain lower than current levels under Scenario L2. A small portion on the western edge of Gateway Park would experience noise levels of about 65 dB DNL. This would be less compatible for the diverse outdoor uses of this park, but a minor impact considering the small area affected. About half of the fairways of Falcon Dunes Golf Course would experience noise levels of 65 to 70 dB.

Scenario L3. Impacts from construction on recreational sites surrounding the airfield would be the same as those under Scenario L1. About 2,000 additional personnel and dependents under this scenario would use recreational facilities and parks throughout Phoenix and the neighborhoods surrounding Luke AFB. This would add a slight increase in visitation and use of local recreational resources. This level of demand within an urban area of 2.3 million residents is inconsequential. The majority of this demand would likely be concentrated in communities on the west side of Phoenix near the base. Most of these communities have active programs and plans for parks and recreational facilities. For example, the City of Glendale is undertaking a comprehensive update of its parks and recreational planning and is one of 88 agencies accredited by the Commission for Accreditation of Park and Recreation Agencies.

Under Scenario L3, an increase in noise on the west side of the airfield would expose the Falcon Dunes Golf Course clubhouse to projected noise levels of about 70 dB DNL. About half of Gateway Park would experience noise levels of about 65 dB DNL. Noise levels at the Falcon Golf Club clubhouse and fairways and adjacent speedway would remain lower than current levels under Scenario L3. About 20 percent of Pueblo Country Club would be exposed to levels above 65 dB DNL. Using FAA guidelines, these levels are compatible with the outdoor areas, but FAA guidelines recommend outdoor-to-indoor noise attenuation of 25 dB for indoor golf facilities above 70 dB DNL. There would be little change at other recreational sites under this scenario.

Scenario L4. Impacts from construction on recreational sites surrounding the airfield would be the same as those under Scenario L1. The about 3,700 additional personnel and dependents under this scenario would use recreational facilities and parks throughout Phoenix and the neighborhoods surrounding Luke AFB. This would add a slight increase in visitation and use of local recreational resources. This level of demand within an urban area of about 2.3 million residents is inconsequential. However, some recreational sites closer to Luke AFB may notice an increase in use.

Impacts under Scenario L4 would be similar to those described under Scenario L3. All of Gateway Park would experience noise levels between 65 and 70 dB DNL, which would have a moderate impact on recreational uses and visitor experiences at this diverse park. Noise levels at the Falcon Golf Club clubhouse and fairways and adjacent speedway would be similar to current levels under Scenario L4. About half of Pueblo Country Club and golf course would be

exposed to levels above 65 dB DNL. An increase in noise exposure on the west side of the airfield would expose progressively more of the Falcon Dunes Golf Course fairways to noise levels between 65 to 70 dB DNL.

Scenario L5. Impacts from construction on recreational sites surrounding the airfield would be the same as those under Scenario L1. The about 5,400 additional personnel and dependents under this scenario would use recreational facilities and parks throughout Phoenix and the neighborhoods surrounding Luke AFB. This would add a slight increase in visitation and use of local recreational resources. This level of demand within an urban area of 2.3 million residents is inconsequential. However, some recreational sites in the communities closer to Luke AFB may notice an increase in use.

Like Scenario L4, under Scenario L5, more of the Falcon Dunes Golf Course fairways would be exposed to higher noise levels, of 65 to 80 dB DNL, and the clubhouse would be exposed to noise levels of about 70 dB DNL. All of Gateway Park would experience noise levels between 65 and 70 dB DNL, which would have a moderate impact on recreational uses and visitor experiences at this diverse park. Most of Pueblo Country Club and golf course would be exposed to levels above 65 dB DNL. The clubhouse at the Falcon Golf Club on the south side of the airfield would experience levels of about 71 dB DNL, similar to baseline conditions. Using FAA guidelines, these levels are compatible with the outdoor areas, but FAA guidelines recommend outdoor-to-indoor noise attenuation of 25 dB for indoor golf facilities.

Scenario L6. Impacts from construction on recreational sites surrounding the airfield would be the same as those under Scenario L1. The about 7,000 additional personnel and dependents under this scenario would use recreational facilities and parks throughout Phoenix and the neighborhoods surrounding Luke AFB. This would add a slight increase in visitation and use of local recreational resources. This level of demand within an urban area of 2.3 million residents is inconsequential. However, some recreational sites closer to Luke AFB may notice an increase in use. At these higher populations, coordination between the base and surrounding cities on housing and a variety of social services and law enforcement issues would be appropriate to ensure a smooth integration.

Under Scenario L6, an increase in noise exposure on the west side of the airfield would increase noise on the Falcon Dunes Golf Course fairways to levels between 65 and 70 dB DNL and at the clubhouse, to about 72 dB DNL. All of Gateway Park would experience noise levels between 65 and 70 dB DNL, which would have a moderate impact on recreational uses and visitor experiences at this diverse park. The clubhouse at Falcon Golf Club would be exposed to noise levels above 70 dB DNL as well. Using FAA guidelines, these levels are compatible with the outdoor areas, but FAA guidelines recommend outdoor-to-indoor noise attenuation of 25 dB for indoor golf facilities. In addition, sports fields and ball courts at the Dysart High School to the northeast of the airfield would experience noise levels of 65 to 70 dB DNL. These levels are compatible with this type of active outdoor recreation. The entire Pueblo Country Club and golf course to the northeast of the airfield would experience noise levels of 65 to 70 dB DNL. This level of noise exposure is compatible with outdoor golf activities.

LU 3.10.2 Airspace

LU 3.10.2.1 Airspace Affected Environment

Land Use

This section summarizes land ownership and Special Use Land Management Areas (SULMAs) underlying the airspace units associated with Luke AFB. SULMAs include selected areas managed by Federal and state agencies that provide recreational and scenic opportunities (e.g., parks, monuments, and scenic river corridors), solitude or a wilderness experience (e.g., forests and wilderness areas), conservation of natural or cultural resources (e.g., wildlife refuge areas and national monuments) and other special management functions (e.g., Native American reservation lands). SULMAs often provide a combination of the attributes listed above. Some SULMAs may include recreation-oriented sites such as campgrounds, trails, and visitor centers; recreation is addressed separately below.

As illustrated in Figure LU 3.10–8, the airspace is located within Arizona only. The majority of Federal land under the airspace is administered by the U.S. Bureau of Indian Affairs and BLM, followed by DoD, the U.S. Forest Service, USFWS, the National Park Service, and the U.S. Bureau of Reclamation.

Fifty-two SULMAs are located underneath one or more airspace units that would support the F-35A mission. The SULMAs and airspace are shown in Figure LU 3.10–8. The SULMAs include wilderness and wilderness study areas (WSAs), national forests, NWRs, national monuments, lakes and reservoirs, Native American reservation lands, and state and regional parks. Baseline subsonic noise levels associated with the different airspace units and SULMAs are identified in Table LU 3.10–6. Supersonic operations are authorized in the Gladden/Bagdad MOA/ATCAA Complex, R-2301E Air-to-Air Area, and Sells MOA/ATCAA. Baseline supersonic noise levels and the number of sonic booms per day for each of these airspaces are shown in Tables LU 3.10–7 and LU 3.10–8, respectively.

Auxiliary Airfields

Aux-1

Arizona Revised Statutes. Areas surrounding Aux-1 are subject to Arizona statutes that limit development to prevent encroachment. A set of noise contours for Aux-1 were codified into law, thus stabilizing the area within which noise-based land use restrictions can occur. Within this territory, land use restrictions only apply within the 65 dB DNL or greater JLUS noise contours (see Figure LU 3.10–9). ARS 28-8481 defines compatible land uses within the 65–69, 70–74, 75–79, and 80 and higher dB DNL JLUS noise contours and the high noise zone.

Joint Land Use Study Part One: Luke AFB Auxiliary Airfield 1. The Aux-1 JLUS (ADC 2004) is intended to guide the decisions made by a variety of public and private entities in relation to compatible land use around Aux-1. The Compatible Land Use Plan contained in the JLUS recommended compatible uses and performance standards that are intended to be used by the City of Surprise and Maricopa County to guide development so as to maintain the operational capabilities of Aux-1, while facilitating the economic development of other key sectors in ways that are compatible with the Luke AFB mission.

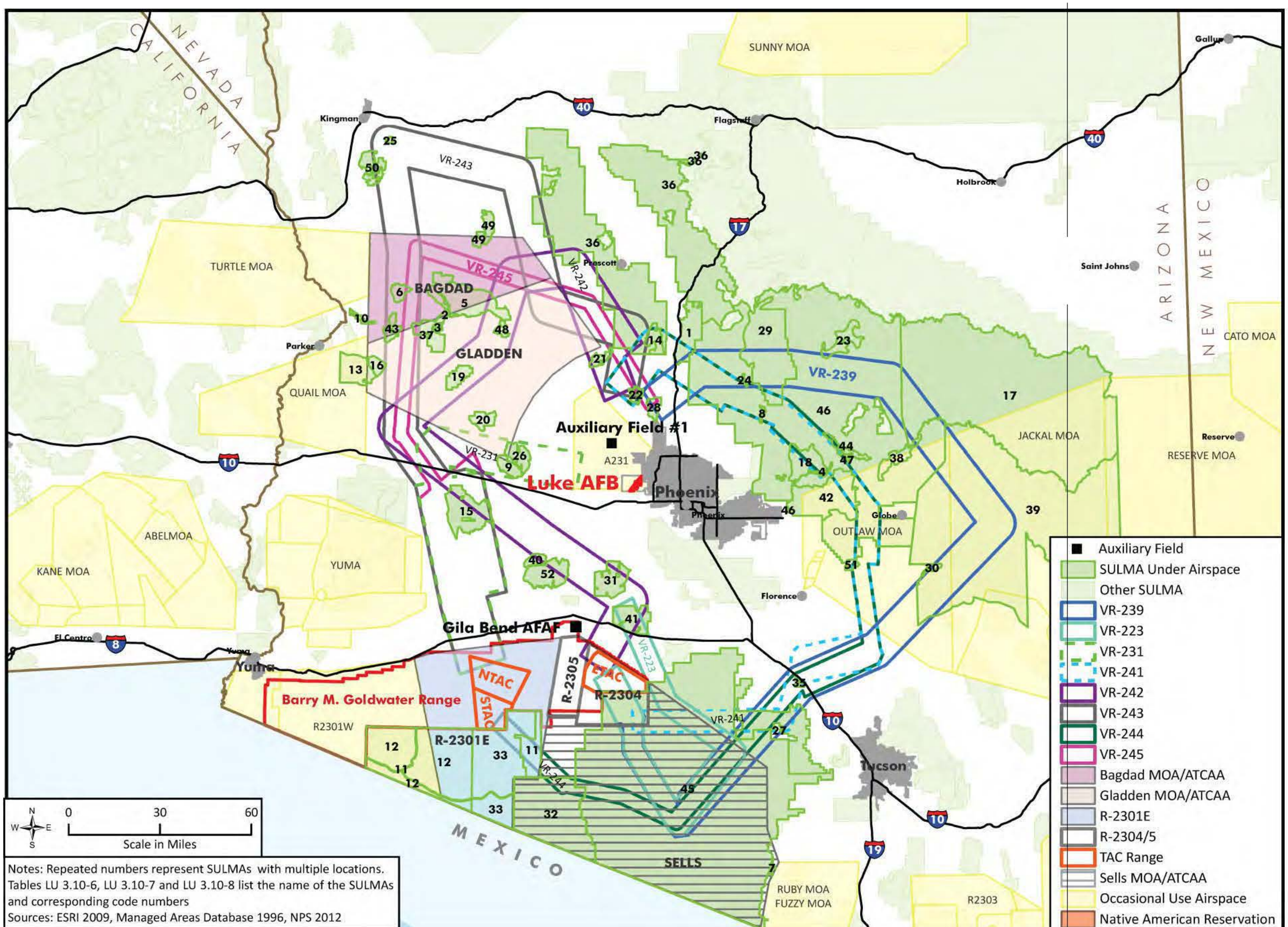


Figure LU 3.10–8. SULMAs and Primary Use Airspace for Luke AFB, Arizona

Table LU 3.10–6. Subsonic Noise Levels (DNL_{mr}) by Airspace and Associated SULMAs for Luke AFB Primary Use Airspace, Baseline Conditions and F-35A Beddown Scenarios

				Baseline Conditions	*Scenario L1 (24 Aircraft)*		*Scenario L2 (48 Aircraft)*		*Scenario L3 (72 Aircraft)*		*Scenario L4 (96 Aircraft)*		*Scenario L5 (120 Aircraft)*		*Scenario L6 (144 Aircraft)*	
SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
Gladden/Bagdad MOA/ATCAA Complex																
2	Alamo Lake	12,095	100	< 45	45	0	48	3	50	5	51	6	52	7	53	8
3	Alamo SP	4,767	100	< 45	45	0	48	3	50	5	51	6	52	7	53	8
5	Arrastra Mountain Wilderness	129,318	100	< 45	45	0	48	3	50	5	51	6	52	7	53	8
6	Aubrey Peak Wilderness	15,917	100	< 45	45	0	48	3	50	5	51	6	52	7	53	8
9	Big Horn Mountains Wilderness	21,468	9	< 45	45	0	48	3	50	5	51	6	52	7	53	8
10	Bill Williams NWR	6,122	19	< 45	45	0	48	3	50	5	51	6	52	7	53	8
13	Cactus Plain Wilderness Study Area	59,233	13	< 45	45	0	48	3	50	5	51	6	52	7	53	8
16	East Cactus Plain Wilderness	15,019	100	< 45	45	0	48	3	50	5	51	6	52	7	53	8
19	Harcuvar Mountains Wilderness	25,495	100	< 45	45	0	48	3	50	5	51	6	52	7	53	8
20	Harquahala Mountains Wilderness	22,587	100	< 45	45	0	48	3	50	5	51	6	52	7	53	8
26	Hummingbird Springs Wilderness	30,074	12	< 45	45	0	48	3	50	5	51	6	52	7	53	8
37	Rawhide Mountains Wilderness	38,255	7	< 45	45	0	48	3	50	5	51	6	52	7	53	8
43	Swansea Wilderness	17,093	75	< 45	45	0	48	3	50	5	51	6	52	7	53	8
48	Tres Alamos Wilderness	8,044	100	< 45	45	0	48	3	50	5	51	6	52	7	53	8
49	Upper Burro Creek Wilderness	27,182	34	< 45	45	0	48	3	50	5	51	6	52	7	53	8
R-2301E Air-to-Air Area																
11	Cabeza Prieta NWR	74,101	88	55	58	3	61	6	62	7	64	9	65	10	65	10
12	Cabeza Prieta Wilderness	447,455	44	55	58	3	61	6	62	7	64	9	65	10	65	10
33	Organ Pipe Cactus Wilderness	618,026	54	55	58	3	61	6	62	7	64	9	65	10	65	10

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario L1 (24 Aircraft)		Scenario L2 (48 Aircraft)		Scenario L3 (72 Aircraft)		Scenario L4 (96 Aircraft)		Scenario L5 (120 Aircraft)		Scenario L6 (144 Aircraft)	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
Sells MOA/ATCAA																
7	Baboquivari Peak Wilderness	2,775	100	< 45	< 45	0	47	2	49	4	50	5	51	6	52	7
11	Cabeza Prieta NWR	74,101	2	< 45	< 45	0	47	2	49	4	50	5	51	6	52	7
32	Organ Pipe Cactus NM	51,777	98	< 45	< 45	0	47	2	49	4	50	5	51	6	52	7
33	Organ Pipe Cactus Wilderness	618,026	46	< 45	< 45	0	47	2	49	4	50	5	51	6	52	7
45	Tohono O'odham Indian Reservation	2,788,059	77	< 45	< 45	0	47	2	49	4	50	5	51	6	52	7
VR-223																
27	Ironwood Forest NM	187,241	< 0.1	47	49	2	52	5	53	6	55	8	55	8	56	9
41	South Maricopa Mountains Wilderness	59,014	68	47	49	2	52	5	53	6	55	8	55	8	56	9
45	Tohono O'odham Indian Reservation	2,788,059	20	47	49	2	52	5	53	6	55	8	55	8	56	9
VR-231																
9	Big Horn Mountains Wilderness	21,468	100	47	49	2	52	5	53	6	54	7	55	8	56	9
15	Eagletail Mountains Wilderness	100,623	99	47	49	2	52	5	53	6	54	7	55	8	56	9
26	Hummingbird Springs Wilderness	30,074	100	47	49	2	52	5	53	6	54	7	55	8	56	9
VR-239																
1	Agua Fria NM	75,485	5	< 45	54	9	57	12	58	13	60	15	61	16	61	16
17	Fort Apache Indian Reservation	1,675,379	5	< 45	54	9	57	12	58	13	60	15	61	16	61	16
22	Hells Canyon Wilderness	9,852	< 1	< 45	54	9	57	12	58	13	60	15	61	16	61	16
23	Hellsgate Wilderness	38,893	4	< 45	54	9	57	12	58	13	60	15	61	16	61	16
24	Horseshoe Reservoir	1,804	100	< 45	54	9	57	12	58	13	60	15	61	16	61	16
27	Ironwood Forest NM	187,241	37	< 45	54	9	57	12	58	13	60	15	61	16	61	16
28	Lake Pleasant Regional Park	14,857	48	< 45	54	9	57	12	58	13	60	15	61	16	61	16
29	Mazatzal Wilderness	249,157	43	< 45	54	9	57	12	58	13	60	15	61	16	61	16

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario L1 (24 Aircraft)		Scenario L2 (48 Aircraft)		Scenario L3 (72 Aircraft)		Scenario L4 (96 Aircraft)		Scenario L5 (120 Aircraft)		Scenario L6 (144 Aircraft)	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
30	Needle's Eye Wilderness	6,283	57	< 45	54	9	57	12	58	13	60	15	61	16	61	16
35	Pichacho Peak SP	3,703	100	< 45	54	9	57	12	58	13	60	15	61	16	61	16
38	Salt River Canyon Wilderness	32,072	9	< 45	54	9	57	12	58	13	60	15	61	16	61	16
39	San Carlos Indian Reservation	1,867,084	26	< 45	54	9	57	12	58	13	60	15	61	16	61	16
45	Tohono O'odham Indian Reservation	2,788,059	18	< 45	54	9	57	12	58	13	60	15	61	16	61	16
46	Tonto National Forest	2,346,914	22	< 45	54	9	57	12	58	13	60	15	61	16	61	16
VR-241																
1	Agua Fria NM	75,485	26	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
4	Apache Lake	4,515	51	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
8	Bartlett Reservoir	3,071	84	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
14	Castle Creek Wilderness	24,506	92	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
18	Four Peaks Wilderness	60,559	57	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
22	Hells Canyon Wilderness	9,852	86	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
24	Horseshoe Reservoir	1,804	32	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
27	Ironwood Forest NM	187,241	37	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
29	Mazatzal Wilderness	249,158	5	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
35	Pichacho Peak SP	3,703	86	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
36	Prescott National Forest	1,303,884	2	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
42	Superstition Wilderness	159,100	22	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
44	Theodore Roosevelt Lake	17,216	4	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
45	Tohono O'odham Indian Reservation	2,788,059	6	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
46	Tonto National Forest	2,346,914	18	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
47	Tonto NM	1,450	22	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
51	White Canyon Wilderness	6,987	32	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3

SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	*Baseline Conditions* DNL_{mr}	*Scenario L1 (24 Aircraft)* DNL_{mr}	*Scenario L1 (24 Aircraft)* Change	*Scenario L2 (48 Aircraft)* DNL_{mr}	*Scenario L2 (48 Aircraft)* Change	*Scenario L3 (72 Aircraft)* DNL_{mr}	*Scenario L3 (72 Aircraft)* Change	*Scenario L4 (96 Aircraft)* DNL_{mr}	*Scenario L4 (96 Aircraft)* Change	*Scenario L5 (120 Aircraft)* DNL_{mr}	*Scenario L5 (120 Aircraft)* Change	*Scenario L6 (144 Aircraft)* DNL_{mr}	*Scenario L6 (144 Aircraft)* Change
VR-242																
5	Arrastra Mountain Wilderness	129,318	15	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
15	Eagletail Mountains Wilderness	100,623	33	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
19	Harcuvar Mountains Wilderness	25,495	100	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
21	Hassayampa River Canyon Wilderness	12,686	96	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
22	Hells Canyon Wilderness	9,852	1	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
31	North Maricopa Mountains Wilderness	61,217	83	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
36	Prescott National Forest	1,303,884	7	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
40	Signal Mountain Wilderness	13,137	34	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
41	South Maricopa Mountains Wilderness	59,014	70	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
48	Tres Alamos Wilderness	8,044	100	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
52	Woolsey Peak Wilderness	65,040	27	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
VR-243																
6	Aubrey Peak Wilderness	15,917	100	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
14	Castle Creek Wilderness	24,506	4	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
15	Eagletail Mountains Wilderness	100,623	98	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
16	East Cactus Plain Wilderness	15,020	1	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
21	Hassayampa River Canyon Wilderness	12,687	4	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
22	Hells Canyon Wilderness	9,852	43	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
25	Hualapai Mountain CP	2379	100	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
36	Prescott National Forest	1,303,884	8	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
37	Rawhide Mountains Wilderness	38,255	12	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
43	Swansea Wilderness	17,093	94	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3
50	Wabayuma Peak Wilderness	38,597	33	< 45	< 45	0	< 45	0	45	0	47	2	47	2	48	3

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario L1 (24 Aircraft)		Scenario L2 (48 Aircraft)		Scenario L3 (72 Aircraft)		Scenario L4 (96 Aircraft)		Scenario L5 (120 Aircraft)		Scenario L6 (144 Aircraft)	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
VR-244																
1	Agua Fria NM	75,485	26	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
4	Apache Lake	4,515	28	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
8	Bartlett Reservoir	3,071	85	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
11	Cabeza Prieta National Wildlife Refuge	74,101	46	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
14	Castle Creek Wilderness	24,506	92	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
18	Four Peaks Wilderness	60,559	45	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
22	Hells Canyon Wilderness	9,852	85	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
24	Horseshoe Reservoir	1,804	31	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
27	Ironwood Forest NM	187,241	20	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
29	Mazatzal Wilderness	249,158	5	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
32	Organ Pipe Cactus NM	51,777	12	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
34	Organ Pipe Cactus Wilderness	336,896	9	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
33	Organ Pipe Cactus Wilderness	281,130	9	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
35	Pichacho Peak SP	3,703	100	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
36	Prescott National Forest	1,303,884	2	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
42	Superstition Wilderness	159,100	22	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
44	Theodore Roosevelt Lake	17,216	22	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
45	Tohono O'odham Indian Reservation	2,788,059	9	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
46	Tonto National Forest	2,346,914	19	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
47	Tonto NM	1,450	11	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3
51	White Canyon Wilderness	6,987	32	< 45	< 45	0	< 45	0	46	1	47	2	48	3	48	3

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario L1 (24 Aircraft)		Scenario L2 (48 Aircraft)		Scenario L3 (72 Aircraft)		Scenario L4 (96 Aircraft)		Scenario L5 (120 Aircraft)		Scenario L6 (144 Aircraft)	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
VR-245																
6	Aubrey Peak Wilderness	15,917	9	< 45	54	9	57	12	58	13	60	15	61	16	61	16
15	Eagletail Mountains Wilderness	100,623	98	< 45	54	9	57	12	58	13	60	15	61	16	61	16
21	Hassayampa River Canyon Wilderness	12,687	5	< 45	54	9	57	12	58	13	60	15	61	16	61	16
22	Hells Canyon Wilderness	9,852	33	< 45	54	9	57	12	58	13	60	15	61	16	61	16
28	Lake Pleasant Regional Park	14,857	27	< 45	54	9	57	12	58	13	60	15	61	16	61	16
36	Prescott National Forest	1,303,884	1	< 45	54	9	57	12	58	13	60	15	61	16	61	16
37	Rawhide Mountains Wilderness	38,255	7	< 45	54	9	57	12	58	13	60	15	61	16	61	16

Key: NM=national monument; SP=state park.

Table LU 3.10–7. Supersonic Noise Levels (CDNL) by Airspace and Associated SULMAs for Luke AFB Primary Use Airspace, Baseline Conditions and F-35A Beddown Scenarios

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario L1 (24 Aircraft)		Scenario L2 (48 Aircraft)		Scenario L3 (72 Aircraft)		Scenario L4 (96 Aircraft)		Scenario L5 (120 Aircraft)		Scenario L6 (144 Aircraft)	
				CDNL	CDNL	Change	CDNL	Change	CDNL	Change	CDNL	Change	CDNL	Change	CDNL	Change
Gladden/Bagdad MOA/ATCAA Complex																
2	Alamo Lake	12,095	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
3	Alamo SP	4,767	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
5	Arrastra Mountain Wilderness	129,318	71	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
6	Aubrey Peak Wilderness	15,917	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
9	Big Horn Mountains Wilderness	21,468	9	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
10	Bill Williams NWR	6,122	19	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
13	Cactus Plain Wilderness Study Area	59,223	13	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
16	East Cactus Plain Wilderness	15,019	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
19	Harcuvar Mountains Wilderness	25,495	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
20	Harquahala Mountains Wilderness	22,587	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
26	Hummingbird Springs Wilderness	30,074	12	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
37	Rawhide Mountains Wilderness	38,255	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
43	Swansea Wilderness	17,093	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
48	Tres Alamos Wilderness	8,044	100	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
49	Upper Burro Creek Wilderness	27,182	34	54	47	(7)	48	(6)	49	(5)	50	(4)	51	(3)	51	(3)
R-2301E Air-to-Air Area																
11	Cabeza Prieta NWR	74,101	88	52	48	(4)	48	(4)	48	(4)	48	(4)	48	(4)	49	(3)
12	Cabeza Prieta Wilderness	447,455	44	52	48	(4)	48	(4)	48	(4)	48	(4)	48	(4)	49	(3)
33	Organ Pipe Cactus Wilderness	618,026	54	52	48	(4)	48	(4)	48	(4)	48	(4)	48	(4)	49	(3)

				Baseline Conditions	***Scenario L1 (24 Aircraft)***		***Scenario L2 (48 Aircraft)***		***Scenario L3 (72 Aircraft)***		***Scenario L4 (96 Aircraft)***		***Scenario L5 (120 Aircraft)***		***Scenario L6 (144 Aircraft)***	
SULMA No.	***SULMA Name***	***SULMA Acreage***	***Percentage of SULMA Under Airspace***	**CDNL**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**
Sells MOA/ATCAA																
7	Baboquivari Peak Wilderness	2,775	100	54	51	(3)	51	(3)	52	(2)	52	(2)	53	(1)	53	(1)
11	Cabeza Prieta NWR	74,101	2	54	51	(3)	51	(3)	52	(2)	52	(2)	53	(1)	53	(1)
32	Organ Pipe Cactus NM	51,777	98	54	51	(3)	51	(3)	52	(2)	52	(2)	53	(1)	53	(1)
33	Organ Pipe Cactus Wilderness	618,026	46	54	51	(3)	51	(3)	52	(2)	52	(2)	53	(1)	53	(1)
45	Tohono O'odham Indian Reservation	2,788,059	77	54	51	(3)	51	(3)	52	(2)	52	(2)	53	(1)	53	(1)

Note: (Number) denotes a negative number.

Table LU 3.10–8. Sonic Booms per Day by Airspace and Associated SULMAs for Luke AFB Primary Airspace, Baseline Conditions and F-35A Beddown Scenarios

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario L1 (24 Aircraft)		Scenario L2 (48 Aircraft)		Scenario L3 (72 Aircraft)		Scenario L4 (96 Aircraft)		Scenario L5 (120 Aircraft)		Scenario L6 (144 Aircraft)	
				Booms/Day	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change
Gladden/Bagdad MOA/ATCAA Complex																
2	Alamo Lake	12,095	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
5	Arrastra Mountain Wilderness	129,318	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
6	Aubrey Peak Wilderness	15,917	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
3	Alamo SP	4,767	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
10	Bill Williams NWR	6,122	19	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
9	Big Horn Mountains Wilderness	21,468	9	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
13	Cactus Plain Wilderness Study Area	59,223	13	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
16	East Cactus Plain Wilderness	15,019	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
19	Harcuvar Mountains Wilderness	25,495	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
20	Harquahala Mountains Wilderness	22,587	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
26	Hummingbird Springs Wilderness	30,074	12	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
37	Rawhide Mountains Wilderness	38,255	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
43	Swansea Wilderness	17,093	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
48	Tres Alamos Wilderness	8,044	100	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
49	Upper Burro Creek Wilderness	27,182	34	2	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
R-2301E Air-to-Air Area																
11	Cabeza Prieta NWR	74,101	88	3	2	(1)	2	(1)	1	(2)	1	(2)	1	(2)	1	(2)
12	Cabeza Prieta Wilderness	447,455	44	3	2	(1)	2	(1)	1	(2)	1	(2)	1	(2)	1	(2)
33	Organ Pipe Cactus Wilderness	618,026	54	3	2	(1)	2	(1)	1	(2)	1	(2)	1	(2)	1	(2)

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario L1 (24 Aircraft)		Scenario L2 (48 Aircraft)		Scenario L3 (72 Aircraft)		Scenario L4 (96 Aircraft)		Scenario L5 (120 Aircraft)		Scenario L6 (144 Aircraft)	
				Booms/Day	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change	Booms/Day	Change
Sells MOA/ATCAA																
7	Baboquivari Peak Wilderness	2,775	100	3	2	(1)	2	(1)	1	(2)	2	(1)	2	(1)	2	(1)
11	Cabeza Prieta NWR	74,101	2	3	2	(1)	2	(1)	1	(2)	2	(1)	2	(1)	2	(1)
32	Organ Pipe Cactus NM	51,777	98	3	2	(1)	2	(1)	1	(2)	2	(1)	2	(1)	2	(1)
33	Organ Pipe Cactus Wilderness	618,026	46	3	2	(1)	2	(1)	1	(2)	2	(1)	2	(1)	2	(1)
45	Tohono O'odham Indian Reservation	2,788,059	81	3	2	(1)	2	(1)	1	(2)	2	(1)	2	(1)	2	(1)

Note: (Number) denotes a negative number. Sonic boom data shown above are rounded prior to calculating the change from baseline and therefore differ slightly from raw sonic boom data displayed in Table LU 3.2–6 in the Noise section.

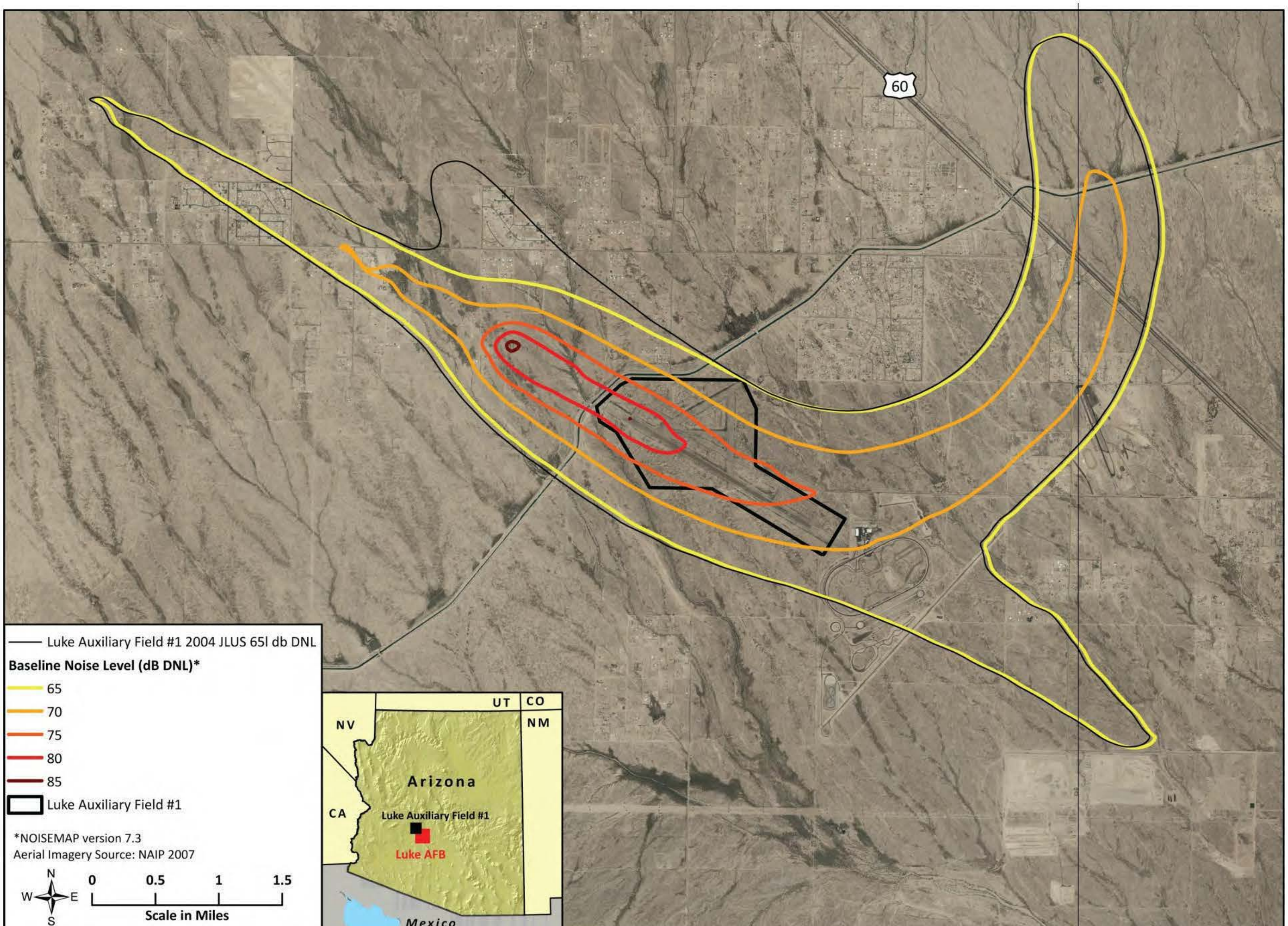


Figure LU 3.10–9. JLUS and Baseline Noise Contours at Aux-1

The JLUS presents F-16 noise contours and "notional" noise contours based on F-22 operations. Because Aux-1 does not have an active runway, standard AICUZ guidance with respect to CZs and APZs would not apply. Therefore, notional CZs and APZs were developed based on specific approach and departure patterns used by aircraft. A Compatible Land Use Plan with seven use zones is displayed in map form, accompanied by recommended compatibility criteria for each use zone. A "vicinity box" in which disclosure and notification procedures are recommended extends beyond the high noise and hazard zones. Implementation of the recommendations for compatible uses would be via amendment of general and comprehensive plans.

The Aux-1 JLUS identifies land uses that are inconsistent with the compatibility criteria established by state legislation and provides compatibility information to be applied by local political jurisdictions with properties in the high hazard and noise zones associated with Aux-1. It also addresses inconsistencies within and between the AICUZ Program and state legislation and recommends implementation standards.

Local Regulations and Ordinances. Maricopa County and its incorporated municipalities have regulations and ordinances that specifically address land use and zoning issues in the territory in the vicinity of Aux-1. The specific regulations and ordinances are contained in the general plans, comprehensive plans, and zoning ordinances of these jurisdictions.

Areas within the vicinity of Aux-1 affected by noise contour levels of 65 dB DNL or greater are shown in Figure LU 3.10–9. Under baseline conditions, approximately 70 people and 6,786 acres off installation are affected by noise levels greater than 65 dB DNL (see Table LU 3.2–2). The existing noise environment at Aux-1 is discussed further in Section LU 3.2.

Areas within the 65 dB DNL or greater JLUS contours for Aux-1 are shown in Figure LU 3.10–9. Approximately 1,023 people and 7,421 acres occur within the 65 dB DNL or greater JLUS noise contours.

Gila Bend AFAF

Gila Bend AFAF is located in Maricopa County approximately 50 miles southwest of Luke AFB and 3 miles south of the town of Gila Bend, Arizona. The airfield encompasses 1,885 acres of land.

Arizona Revised Statutes. Areas surrounding Gila Bend AFAF are subject to Arizona statutes that limit development to prevent encroachment. A set of noise contours for Gila Bend AFAF were codified into law, thus stabilizing the area within which noise-based land use restrictions can occur. Within this territory, land use restrictions only apply within the 65 dB DNL or greater JLUS noise contours (see Figure LU 3.10–9). ARS 28-8481 defines compatible land uses within the 65–69, 70–74, 75–79, and 80 and higher dB DNL JLUS noise contours and the high noise zone.

Joint Land Use Study Part Two: Gila Bend Air Force Auxiliary Field/Barry M. Goldwater Range. The Gila Bend JLUS (ADC 2005) identifies noise contours based on F-16 operations and separately, F-18E operations. The areas contained within the F-18E noise contours are larger

than those for current operations (i.e., using data available in August 2004), thus providing a better ability to accommodate potential noise impacts from future operations. The JLUS defines a "vicinity box" for disclosure and notification, and CZs and APZs and recommends compatibility criteria and implementation strategies.

Local Regulations and Ordinances. The Town of Gila Bend General Plan designates land uses within the vicinity of Gila Bend AFAF as primarily low-density residential and light industrial (Gila Bend 2006). Land uses supported in this designation include service uses, proving grounds, warehouses, business parks, and/or manufacturing-type industrial uses. The plan controls development so that land uses incompatible with the military airfield are avoided. The Maricopa County Comprehensive Plan designates areas within the state-statute defined "high noise zone" of Gila Bend AFAF as "military compatible." As discussed in Section LU 3.10.1, only uses (as defined in the Maricopa County zoning ordinance) found by the Arizona Legislature ordinance to be compatible and consistent with the high noise zone are allowed (Maricopa County 2002).

Areas within the vicinity of Gila Bend AFAF affected by noise levels of 65 dB DNL or greater include five persons and 1,313 acres (see Figure LU 3.10–9). The existing noise environment at Gila Bend AFAF is discussed further in Section LU 3.2.

Areas within the 65 dB DNL or greater JLUS contours for Gila Bend AFAF are shown in Figure LU 3.10–10. Approximately 24 people and 11,047 acres occur within the 65 dB DNL or greater JLUS noise contours.

Recreation

Recreational opportunities underlying Luke AFB airspace are, in general, similar to those described in Section LU 3.10.1.1. The underlying land reflects the same mosaic of Federal, state, and private ownership, with a similar range of outdoor recreational activities. The affected region overlaps with two national forests (Tonto and Prescott), 30 wilderness areas, one WSA, and two NWRs (Cabeza Prieta and Bill Williams) (see Figure LU 3.10–8). The area also has four national monuments (Ironwood Forest, Organ Pipe Cactus, Tonto, and Agua Fria), two state parks (Alamo Lake and Pichacho Peak), and a regional park (Lake Pleasant). In addition, the U.S. Bureau of Reclamation manages five reservoir/lakes that provide water-related recreation. Table LU 3.10–6 lists SULMAs underlying the Luke AFB primary use airspace identified for F-35A training.

Public access is permitted to limited portions of BMGR for recreation (about 138,000 acres of the land). All public access requires a BMGR permit. The Sikes Act stipulates that access for wildlife-oriented recreation shall be provided to the extent possible with military use, while maintaining the priority of the military purpose and safety of public users. Recreational activities within BMGR include camping, driving, hunting, and viewing of cultural and natural resources of interest. Two Special Recreational Management Areas (SRMAs), Sentinel Plan Lava Flow SRMA and Crater Range SRMA, located on BMGR East, are no longer managed by BLM. The proximity of these former SRMAs to active military ranges make them unsuitable for public recreational use. Camping is allowed in the majority of the public use area, with exception of a narrow zone along the boundary of the recreational area and the BMGR East TAC Range.

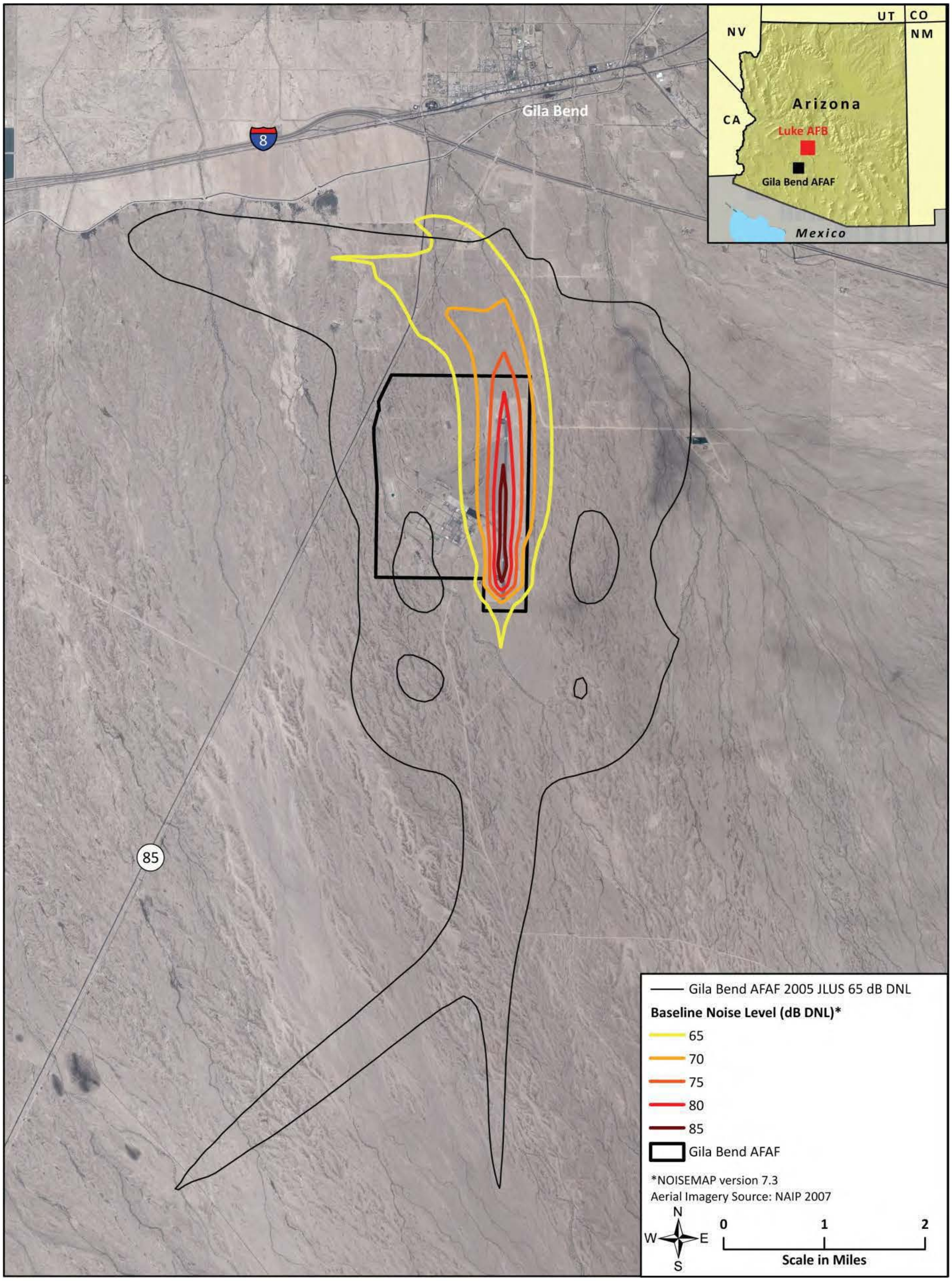


Figure LU 3.10–10. JLUS and Baseline Noise Contours at Gila Bend AFAF

Auxiliary Airfields

Aux-1. Aux-1 is located within the boundary of the city of Surprise and in proximity to the town of Buckeye (approximately 4 miles to the west) and the city of Peoria (approximately 6 miles to the northeast). Each municipality offers a varying spectrum of indoor and outdoor activities, including ball fields/courts, hiking, biking, swimming, and tennis complexes.

Numerous regional and state parks are within 10 miles of the airfield, all offering a wide variety of outdoor recreational activities, including Phoenix Mountain Park, Lake Pleasant Regional Park, White Mountain Regional Park, South Mountain Park, McDowell Mountain Regional Park, and Cave Buttes Recreation Area.

Gila Bend AFAF. Gila Bend AFAF is located within the boundaries of BMGR. Only 38 percent of BMGR is available for public/recreational access (with some areas presenting inherent safety hazards) and then only under specific conditions with strictly regulated permitting. Management Unit 6, an approximately 138,000-acre area situated in and to the south of the Sauceda Mountains, is the on-range public access recreation area located closest to Gila Bend AFAF (Air Force and USN 2007).

LU 3.10.2.2 Airspace Environmental Consequences

Land Use

F-35A flight activities would take place in existing airspace. Therefore, no airspace modifications would be required under any of the scenarios. Existing airspace unit lateral and vertical boundaries would not be expanded under any of the scenarios. Airspace training operations would be consistent with existing airspace operations and would comply with established range and land management plans. Furthermore, safety guidelines and existing range management and land use plans would be updated to address F-35A operations, as necessary. Noise exposure associated with F-35A operations within the airspace is discussed further in Section LU 3.2.

Noise compatibility considerations may differ for various types of SULMAs. Recreational areas, for example, vary in the degree to which quiet is desirable and necessary for a high-quality recreation experience; how much of an area is devoted to developed and undeveloped recreation and the remoteness of the area are also factors. Managers of wildlife areas and preserves frequently consider sensitivity of wildlife to noise, such as startle effects due to sudden changes in noise. Noise impacts on recreation and wildlife are addressed separately in the Recreation section below and in Sections LU 3.6, LU 3.7, and LU 3.8.

Noise modeled for each individual airspace unit was evaluated using GIS techniques to determine if there would be land use impacts on SULMAs located wholly or partially underneath the airspace. For SULMAs that are partially under airspace, noise in areas adjacent to airspace tends to fall off dramatically, particularly because pilots typically fly closer to the center of the airspace. The airspace noise modeling reflects this by tapering the density of operations down toward the edge of a MOA, for example.

Supersonic noise would occur within the Gladden/Bagdad MOA/ATCAA Complex and Sells MOA/ATCAA and within the R-3201E Air-to-Air Area. Sonic boom noise within these airspace units is quite different from subsonic noise. Sonic booms experienced in SULMAs could startle or disturb public recreation users and/or wildlife. The vast majority of noise from air-to-ground use of ranges for projected F-35A munitions training was assumed to occur within the ranges themselves and would have negligible effects on land uses outside the ranges.

Scenario L1. Table LU 3.10–6 presents the SULMAs that underlie the primary use airspace units for Luke AFB and shows the subsonic aircraft noise levels anticipated under Scenario L1. Under Scenario L1, the F-35A training exercises would result in no changes in subsonic airspace noise, compared with baseline conditions, beneath the MOAs, a 3 dB DNL_{mr} increase in the R-2301E Air-to-Air Area, and from no change to an increase of 9 dB DNL_{mr} beneath the centerlines of the Visual Routes. The noise level would remain below 65 dB DNL_{mr} beneath each of the airspace units. SULMAs located under some of the MTRs would be exposed to the largest changes in noise. Subsonic noise levels in those portions of the Tohono O'odham Indian Reservation located underneath the Sells MOA/ATCAA, VR-223, VR-239, VR-241, and VR-244 would remain below 65 dB DNL_{mr}, with increases ranging from 0–9 dB DNL_{mr} compared to baseline conditions. Portions of the Fort Apache Indian Reservation and the San Carlos Indian Reservation would be located underneath VR-239, where noise levels would increase by 9 dB DNL_{mr}, but would remain below 65 dB DNL_{mr}. None of the other reservations shown in Figure LU 2.2–1, would be affected by either subsonic or supersonic noise under any of the proposed scenarios.

Supersonic aircraft operations would occur within Gladden/Bagdad MOA/ATCAA Complex, Sells MOA/ATCAA, and the R-2301E Air-to-Air Area. Scenario L1 would result in a decrease in the supersonic noise level of 7 dB CDNL under the Gladden/Bagdad MOA/ATCAA, 3 dB CDNL under Sells MOA/ATCAA, and 4 dB CDNL under the R-2301E Air-to-Air Area (see Table LU 3.10–6). In addition, the average number of sonic booms experienced per day under Scenario L1 would decrease from two to one in each of the airspace units (see Table LU 3.10–8). The Tohono O'odham Indian Reservation, much of which is located under the Sells MOA/ATCAA, would be exposed to decreases in supersonic noise levels and sonic booms compared to baseline conditions. The Fort Apache Indian Reservation and San Carlos Indian Reservation would not be exposed to supersonic noise under baseline conditions or any of the beddown scenarios.

BLM, USFWS, the U.S. Forest Service, and the National Park Service are mandated to manage wilderness areas for their wilderness qualities, for example, maintaining the natural setting and allowing minimal human disturbance and development. Wilderness management goals could be negatively affected by increased noise and disturbance associated with military overflights. The quality of recreation experiences in wilderness areas, recreation areas, and other specially managed lands could also be affected, depending upon the type of recreation and remoteness of the area.

Scenario L2. Under Scenario L2, the projected F-35A training exercises would increase subsonic airspace noise, compared with baseline conditions, by between 2 and 6 dB DNL_{mr} beneath the MOAs and air-to-air area and between 2 and 12 dB beneath the centerlines of the Visual Routes. Noise levels in the airspace are projected to be between less than 45 dB and 61 dB DNL_{mr} (see

Table LU 3.10–6). SULMAs located under the MTRs would be exposed to some of the largest changes in noise. Subsonic noise levels in those portions of the Tohono O'odham Indian Reservation located underneath military airspace would remain below 65 dB DNL_{mr}, with increases ranging from 0–12 dB DNL_{mr} compared to baseline conditions. Portions of the Fort Apache Indian Reservation and San Carlos Indian Reservation would be exposed to noise level increases of 12 dB DNL_{mr}; however, noise levels would remain below 65 dB DNL_{mr}.

The projected supersonic noise levels would decrease by approximately 6 dB CDNL under Gladden/Bagdad MOA/ATCAA Complex, 3 dB CDNL under Sells MOA/ATCAA, and 4 dB CDNL under the R-2301E Air-to-Air Area, compared with baseline conditions (see Table LU 3.10–7). Noise levels in the airspace are projected to be between 48 and 51 dB CDNL.

Compared with baseline conditions, Scenario L2 would result in a decrease of one daily sonic boom (under each of the airspace units) (see Table LU 3.10–8). The total number of daily sonic booms for any single airspace unit is projected to be between one and two. The Tohono O'odham Indian Reservation, much of which is located under the Sells MOA/ATCAA, would be exposed to decreases in supersonic noise levels and sonic booms compared to baseline conditions.

Scenario L3. Under Scenario L3, the projected F-35A training exercises would increase subsonic airspace noise, compared with baseline conditions, by between 4 and 7 dB DNL_{mr} beneath the MOAs and air-to-air area and by between zero and 13 dB DNL_{mr} beneath the Visual Routes. Noise levels in the airspace are projected to be between 45 and 62 dB DNL_{mr} (see Table LU 3.10–6). SULMAs located under the MTRs would be exposed to the largest changes in noise. Subsonic noise levels in those portions of the Tohono O'odham Indian Reservation located underneath military airspace would remain below 65 dB DNL_{mr}, with increases ranging from 0–13 dB DNL_{mr} compared to baseline conditions. Portions of the Fort Apache Indian Reservation and San Carlos Indian Reservation would be exposed to noise level increases of 13 dB DNL_{mr}; however, noise levels would remain below 65 dB DNL_{mr}.

The projected supersonic noise levels would decrease by approximately 5 dB CDNL under Gladden/Bagdad MOA/ATCAA Complex, 2 dB CDNL under Sells MOA/ATCAA, and 4 dB CDNL under the R-2301E Air-to-Air Area, compared with baseline conditions (see Table LU 3.10–7). Noise levels in the airspace are projected to be between 48 and 52 dB CDNL.

Compared with baseline conditions, Scenario L3 would result in a decrease of between one and two daily sonic booms (under each of the airspace units) (see Table LU 3.10–8). Under Scenario L3, one daily sonic boom would occur under each single airspace unit. The Tohono O'odham Indian Reservation, much of which is located under the Sells MOA/ATCAA, would be exposed to decreases in supersonic noise levels and sonic booms compared to baseline conditions.

Scenario L4. Under Scenario L4, the projected F-35A training exercises would increase subsonic airspace noise, compared with baseline conditions, by between 5 and 9 dB DNL_{mr} beneath the MOAs and air-to-air area and by between 2 and 15 dB DNL_{mr} beneath the centerlines of the Visual Routes. Noise levels in the airspace are projected to be between 47 and 64 dB DNL_{mr} (see Table LU 3.10–6). SULMAs located under the MTRs would be exposed to the largest changes in noise. Subsonic noise levels in those portions of the Tohono O'odham Indian Reservation

located underneath military airspace would remain below 65 dB DNL_{mr}, with increases ranging from 0–15 dB DNL_{mr} compared to baseline conditions. Portions of the Fort Apache Indian Reservation and San Carlos Indian Reservation would be exposed to noise level increases of 15 dB DNL_{mr}; however, noise levels would remain below 65 dB DNL_{mr}.

The projected supersonic noise levels would decrease by approximately 4 dB CDNL under Gladden/Bagdad MOA/ATCAA, 2 dB CDNL under Sells MOA/ATCAA, and 4 dB CDNL under the R-2301 Air-to-Air Area, compared with baseline conditions (see Table LU 3.10–7). Noise levels in the airspace are projected to be between 48 and 52 dB CDNL.

Compared with baseline conditions, Scenario L4 would result in a decrease of between one and two daily sonic booms (under each of the airspace units) (see Table LU 3.10–8). The total number of daily sonic booms for any single airspace unit is projected to be between one and two. The Tohono O'odham Indian Reservation, much of which is located under the Sells MOA/ATCAA, would be exposed to decreases in supersonic noise levels and sonic booms compared to baseline conditions.

Scenario L5. Under Scenario L5, the projected F-35A training exercises would increase subsonic airspace noise, compared with baseline conditions, by between 6 and 10 dB DNL_{mr} beneath the MOAs and air-to-air area and by between 2 and 16 dB DNL_{mr} beneath the centerlines of the Visual Routes. Noise levels in the airspace are projected to be between 47 and 65 dB DNL_{mr} (see Table LU 3.10–6). SULMAs located under the MTRs would be exposed to the largest changes in noise. Subsonic noise levels in those portions of the Tohono O'odham Indian Reservation located underneath military airspace would remain below 65 dB DNL_{mr}, with increases ranging from 0–16 dB DNL_{mr} compared to baseline conditions. Portions of the Fort Apache Indian Reservation and San Carlos Indian Reservation would be exposed to noise level increases of 16 dB DNL_{mr}; however, noise levels would remain below 65 dB DNL_{mr}.

The projected supersonic noise levels would decrease by approximately 3 dB CDNL under Gladden/Bagdad MOA/ATCAA Complex, 1 dB CDNL under Sells MOA/ATCAA, and 4 dB CDNL under the R-2301E Air-to-Air Area, compared with baseline conditions (see Table LU 3.10–7). Noise levels in the airspace are projected to be between 48 and 53 dB CDNL.

Compared with baseline conditions, Scenario L5 would result in a decrease of between one and two daily sonic booms (under each of the airspace units) (see Table LU 3.10–8). The total number of daily sonic booms for any single airspace unit is projected to be between one and two. The Tohono O'odham Indian Reservation, much of which is located under the Sells MOA/ATCAA, would be exposed to decreases in supersonic noise levels and sonic booms compared to baseline conditions.

Scenario L6. Under Scenario L6, the projected F-35A training exercises would increase subsonic airspace noise, compared with baseline conditions, by between 7 and 10 dB DNL_{mr} beneath the MOAs and air-to-air area and by between 3 and 16 dB DNL_{mr} beneath the centerlines of the Visual Routes. Noise levels in the airspace are projected to be between 48 and 65 dB DNL_{mr} (see Table LU 3.10–6). SULMAs located under the MTRs would be exposed to the largest changes in noise. Subsonic noise levels in those portions of the Tohono O'odham Indian Reservation located underneath military airspace would remain below 65 dB DNL_{mr}, with increases ranging from 0–16 dB DNL_{mr} compared to baseline conditions. Portions of the Fort

Apache Indian Reservation and San Carlos Indian Reservation would be exposed to noise level increases of 16 dB DNL_{mr}; however, noise levels would remain below 65 dB DNL_{mr}.

The projected supersonic noise levels would decrease by approximately 3 dB CDNL under Gladden/Bagdad MOA/ATCAA Complex, 1 dB CDNL under Sells MOA/ATCAA, and 3 dB CDNL under the R-2301E Air-to-Air Area, compared with baseline conditions (see Table LU 3.10–7). Noise levels in the airspace are projected to be between 49 and 53 dB CDNL.

Compared with baseline conditions, Scenario L6 would result in a decrease of between one and two daily sonic booms (under each of the airspace units) (see Table LU 3.10–8). The total number of daily sonic booms for any single airspace unit is projected to be between one and two. The Tohono O'odham Indian Reservation, much of which is located under the Sells MOA/ATCAA, would be exposed to decreases in supersonic noise levels and sonic booms compared to baseline conditions.

Auxiliary Airfields

Aux-1. The F-35A beddown of training aircraft would not require construction or modification of facilities within Aux-1 under any of the F-35A aircraft scenarios.

<u>Scenario L1.</u> As presented in Table LU 3.2–12, Scenario L1 would decrease the area and population surrounding Aux-1 within the 65 dB DNL or greater noise contour by 5,398 acres and 585 people compared with baseline conditions.

Areas outside of the 65 dB DNL or greater JLUS noise contours would not be affected by noise levels between 65 and 69 dB DNL under Scenario L1 (see Figure LU 3.10–11).

<u>Scenario L2.</u> As presented in Table LU 3.2–12, Scenario L2 would decrease the area and population surrounding Aux-1 within the 65 dB DNL or greater noise contour by 4,492 acres and 460 people compared with baseline conditions.

Approximately 84 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L2 (see Figure LU 3.10–12).

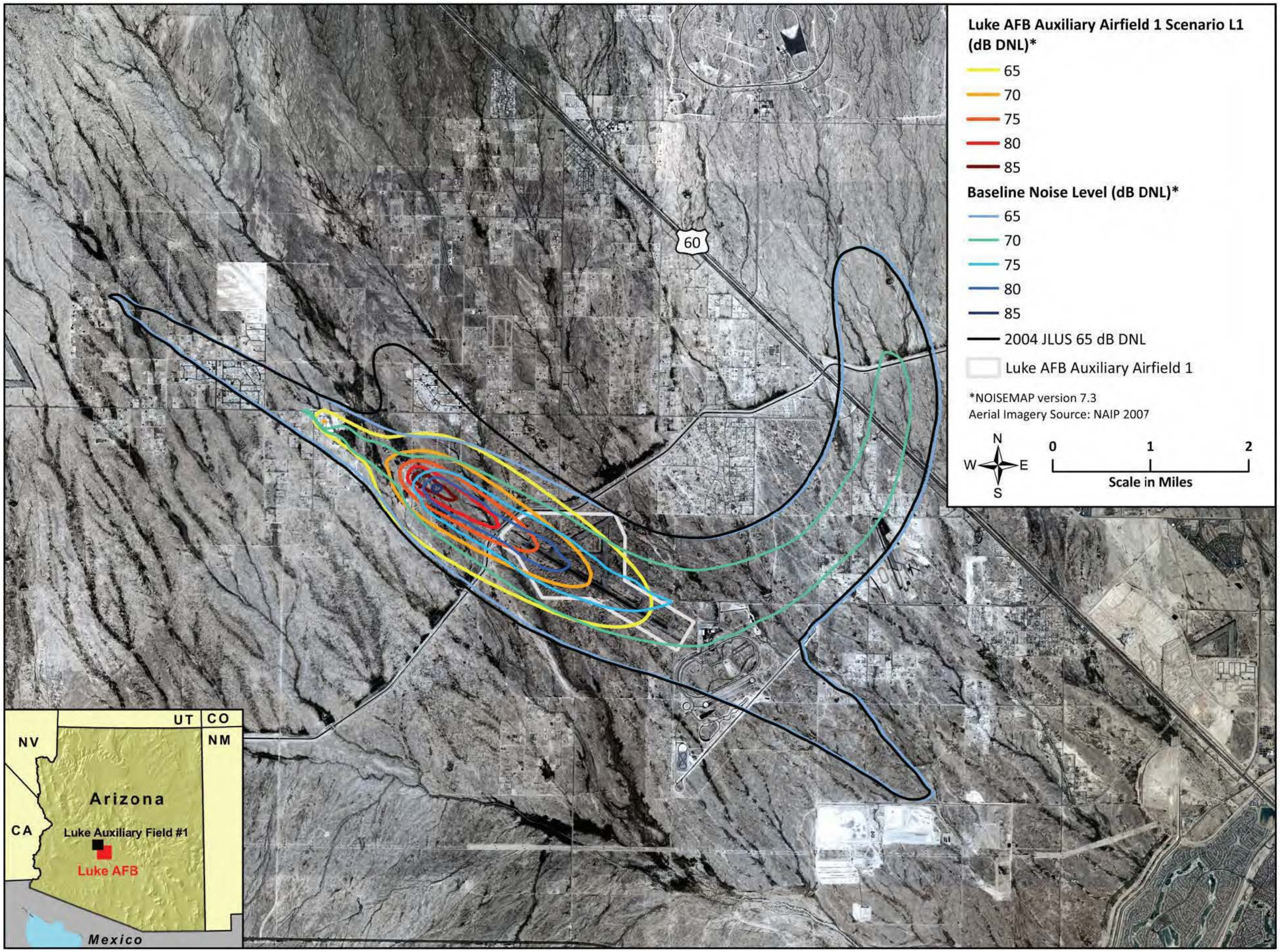


Figure LU 3.10–11. JLUS and Scenario L1 Noise Contours at Aux-1

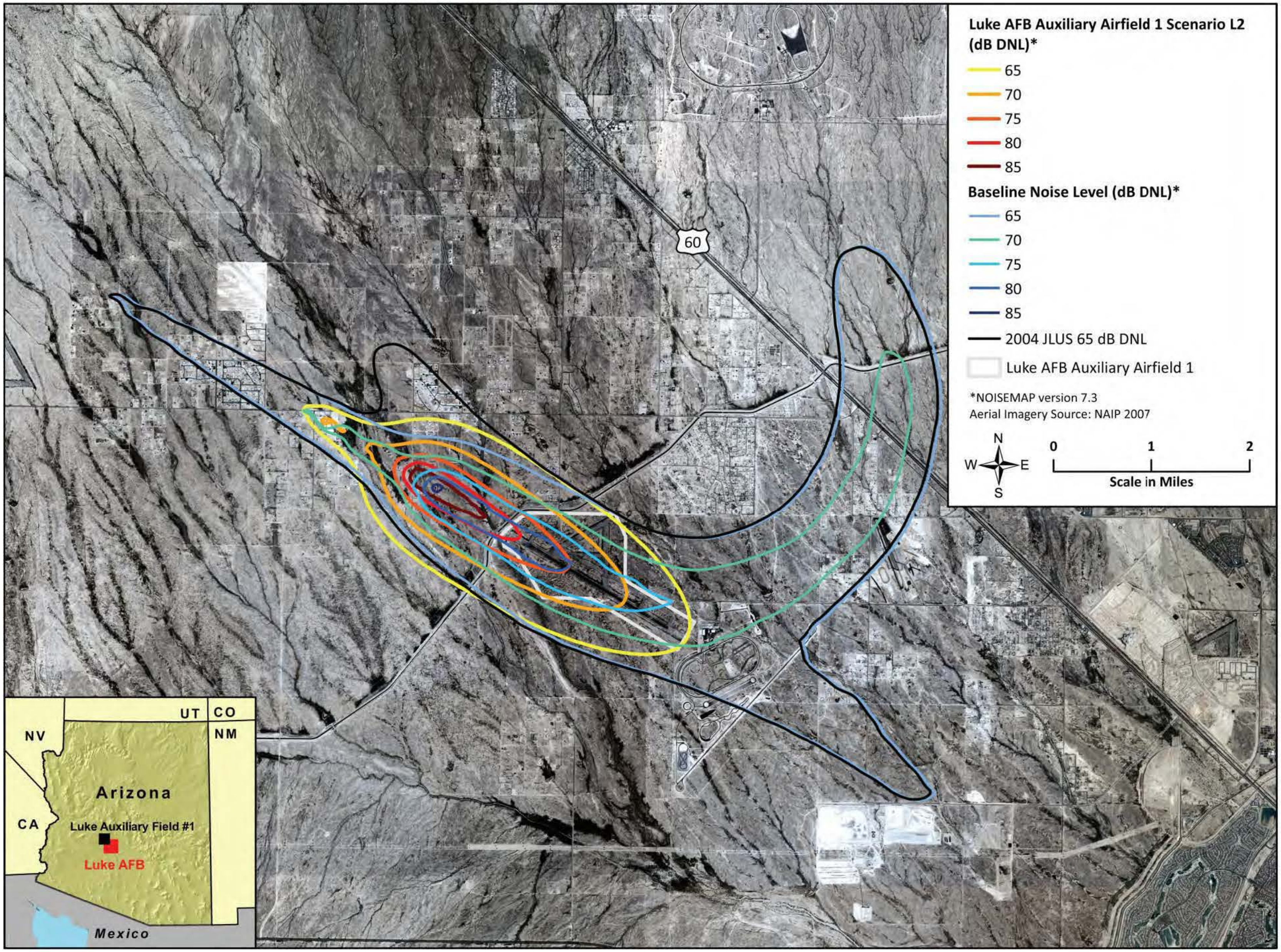


Figure LU 3.10–12. JLUS and Scenario L2 Noise Contours at Aux-1

<u>Scenario L3.</u> As presented in Table LU 3.2–12, Scenario L3 would decrease the area and population surrounding Aux-1 within the 65 dB DNL or greater noise contour by 3,583 acres and 383 people compared with baseline conditions.

Approximately 412 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels greater than 65 dB DNL under Scenario L3 (see Figure LU 3.10–13).

<u>Scenario L4.</u> As presented in Table LU 3.2–12, Scenario L4 would decrease the area surrounding Aux-1 within the 65 dB DNL or greater noise contour by 2,781 acres compared with baseline conditions. There would also be a decrease of 222 persons affected by noise levels greater than 65 dB DNL under this scenario.

A total of 831 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise greater than 65 dB DNL under Scenario L4 (see Figure LU 3.10–14). Approximately 2 acres would be affected by noise levels between 65 and 69 dB DNL, and 829 acres would be affected by noise levels between 70 and 74 dB DNL.

<u>Scenario L5.</u> As presented in Table LU 3.2–12, Scenario L5 would decrease the area surrounding Aux-1 within the 65 dB DNL or greater noise contour by 2,022 acres compared with baseline conditions. The estimated decrease in the number of persons affected by noise levels greater than 65 dB DNL would be 63.

A total of 1,271 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise greater than 65 dB DNL under Scenario L5 (see Figure LU 3.10–15). Approximately 26 acres would be affected by noise levels between 65 and 69 dB DNL, and 1,245 acres would be affected by noise levels between 70 and 74 dB DNL.

<u>Scenario L6.</u> As presented in Table LU 3.2–12, Scenario L6 would decrease the area surrounding Aux-1 within the 65 dB DNL or greater noise contour by 1,335 acres compared with baseline conditions. However, the estimated increase in the number of persons affected by noise levels greater than 65 dB DNL would be 92.

A total of 1,696 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise greater than 65 dB DNL under Scenario L6 (see Figure LU 3.10–16). Approximately 66 acres would be affected by noise levels between 65 and 69 dB DNL, and 1,630 acres would be affected by noise levels between 70 and 74 dB DNL.

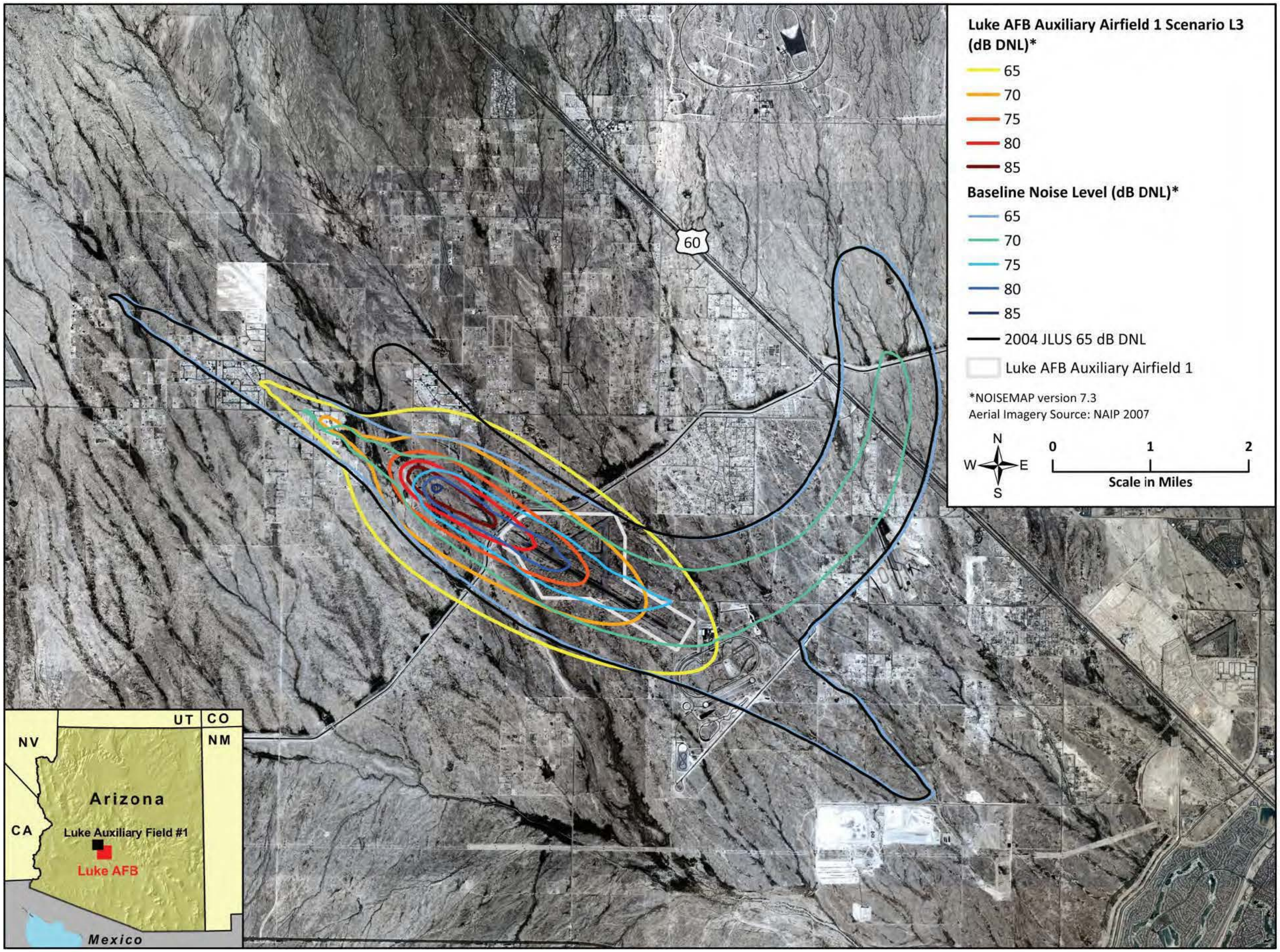


Figure LU 3.10–13. JLUS and Scenario L3 Noise Contours at Aux-1

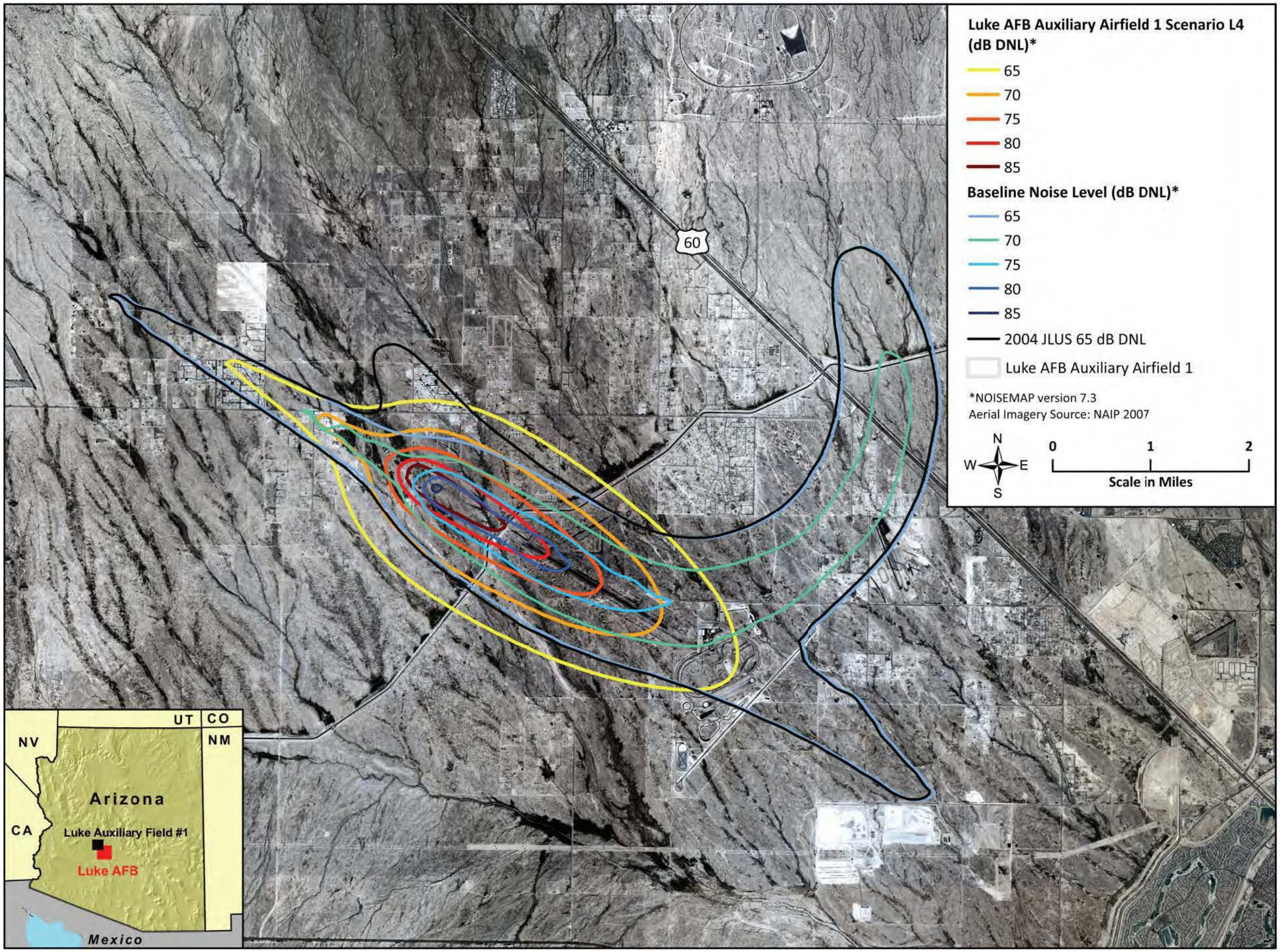


Figure LU 3.10–14. JLUS and Scenario L4 Noise Contours at Aux-1

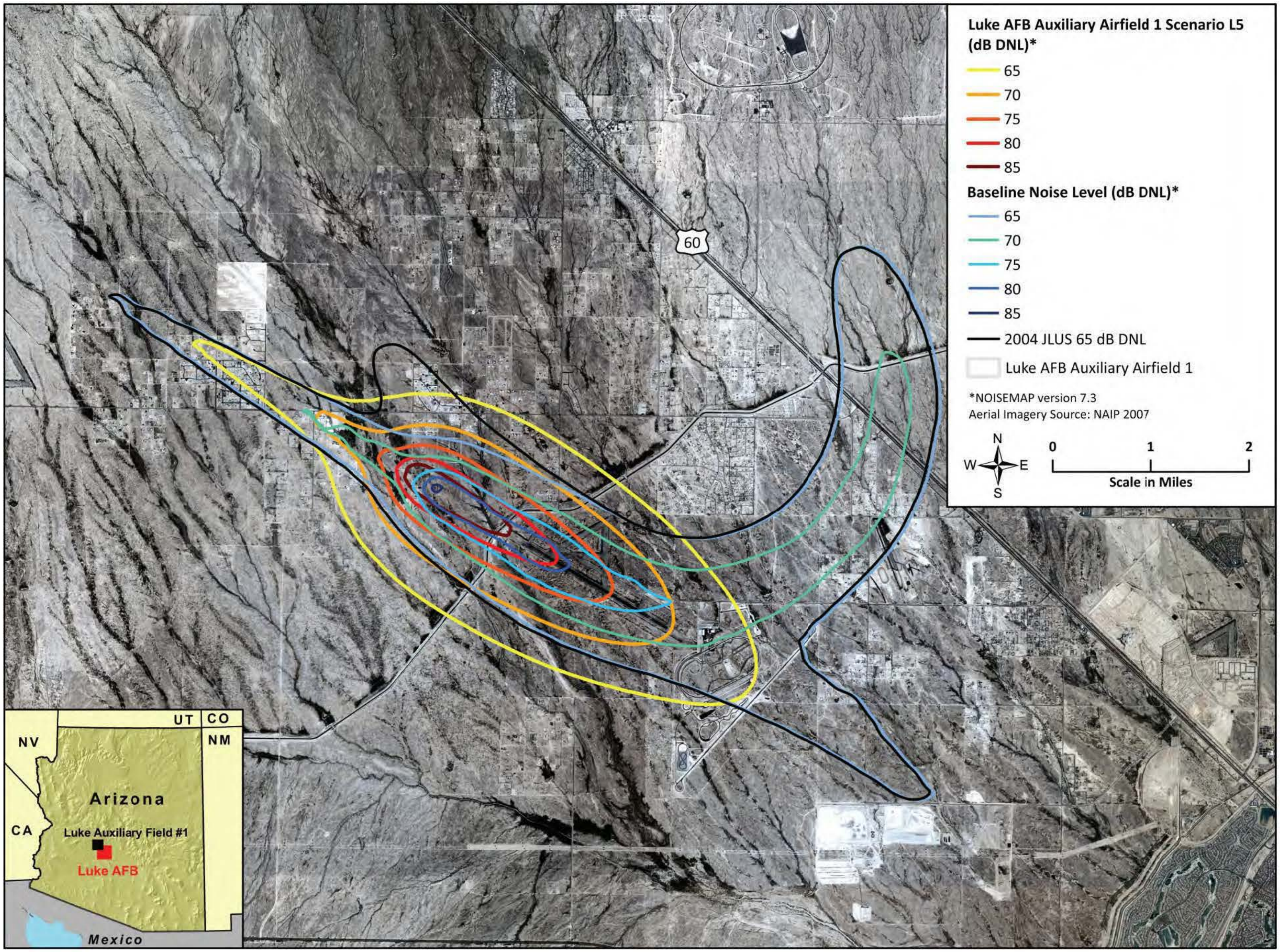


Figure LU 3.10–15. JLUS and Scenario L5 Noise Contours at Aux-1

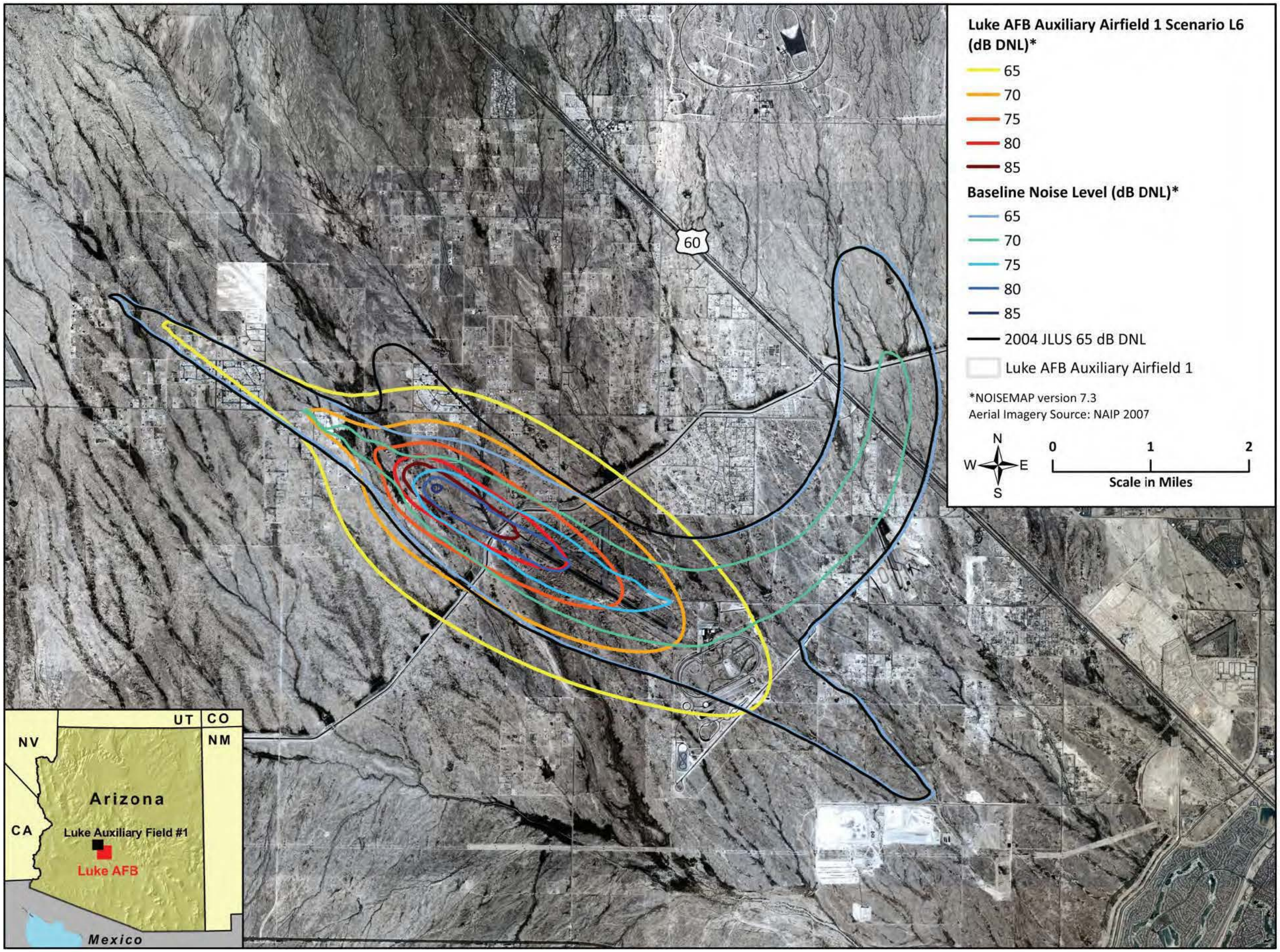


Figure LU 3.10–16. JLUS and Scenario L6 Noise Contours at Aux-1

Gila Bend AFAF. Implementation of Scenarios L1 through L6 would not require construction or modification of facilities within Gila Bend AFAF.

Scenario L1. As presented in Table LU 3.2–10, Scenario L1 would increase the area surrounding Gila Bend AFAF within the 65 dB DNL or greater noise contour by 246 acres compared with baseline conditions. The estimated decrease in the number of persons affected by noise levels greater than 65 dB DNL would be two.

Areas outside of the 65 dB DNL or greater JLUS noise contours would not be affected by noise levels between 65 and 69 dB DNL under Scenario L1 (see Figure LU 3.10–17).

Scenario L2. As presented in Table LU 3.2–10, Scenario L2 would increase the area surrounding Gila Bend AFAF within the 65 dB DNL or greater noise contour by 1,184 acres compared with baseline conditions. The estimated increase in the number of persons affected by noise levels greater than 65 dB DNL would be two.

Approximately 37 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels greater than 65 dB DNL under Scenario L2 (see Figure LU 3.10–18).

Scenario L3. As presented in Table LU 3.2–10, Scenario L3 would increase the area surrounding Gila Bend AFAF within the 65 dB DNL or greater noise contour by 1,981 acres compared with baseline conditions. The estimated increase in the number of persons affected by noise levels greater than 65 dB DNL would be six.

Approximately 174 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L3 (see Figure LU 3.10–19).

Scenario L4. As presented in Table LU 3.2–10, Scenario L4 would increase the area surrounding Gila Bend AFAF within the 65 dB DNL or greater noise contour by 2,682 acres compared with baseline conditions. The estimated increase in the number of persons affected by noise levels greater than 65 dB DNL would be eight.

Approximately 319 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L4 (see Figure LU 3.10–20).

Scenario L5. As presented in Table LU 3.2–10, Scenario L5 would increase the area surrounding Gila Bend AFAF within the 65 dB DNL or greater noise contour by 3,310 acres compared with baseline conditions. The estimated increase in the number of persons affected by noise levels greater than 65 dB DNL would be 10.

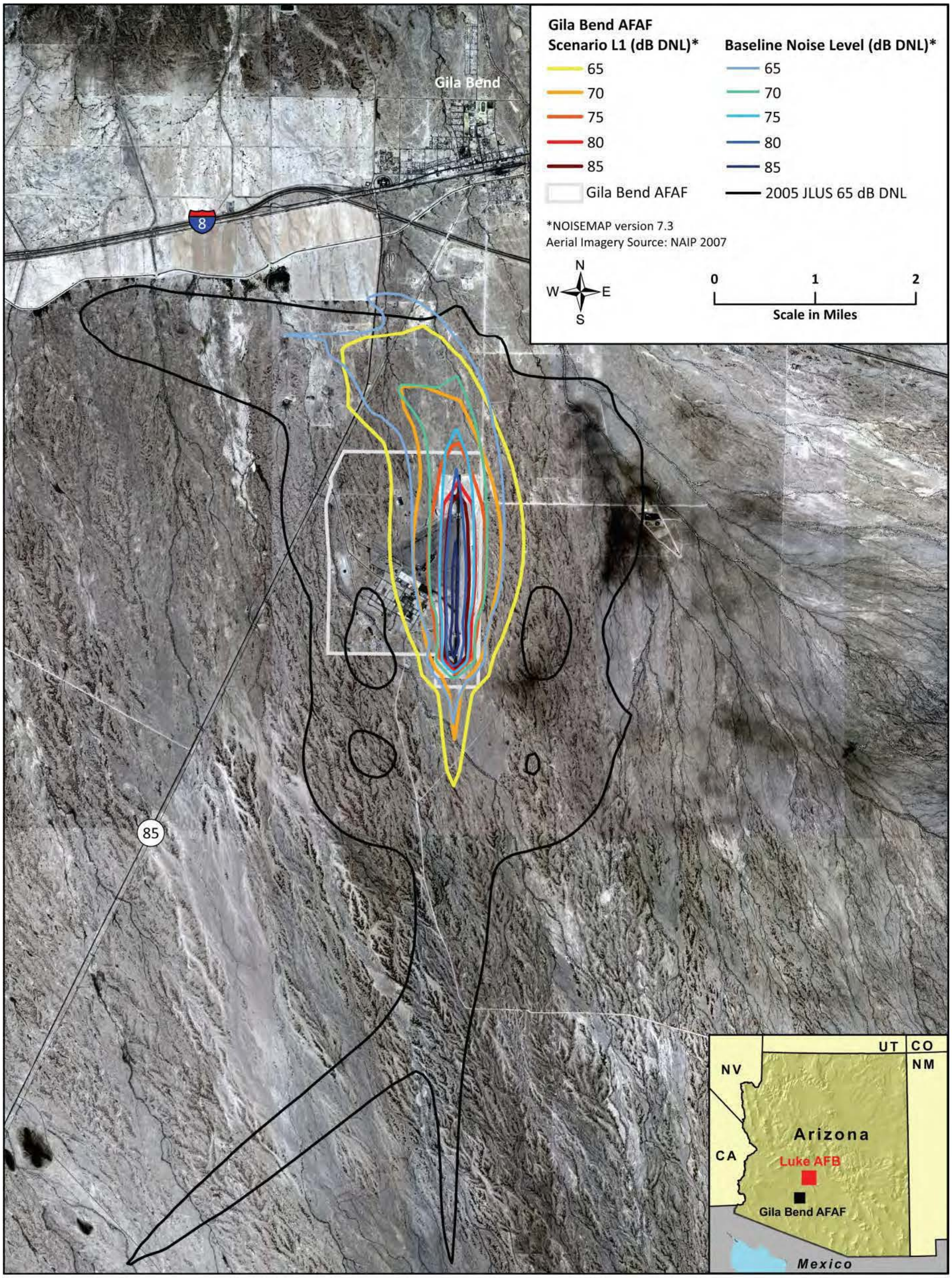


Figure LU 3.10–17. JLUS and Scenario L1 Noise Contours at Gila Bend AFAF

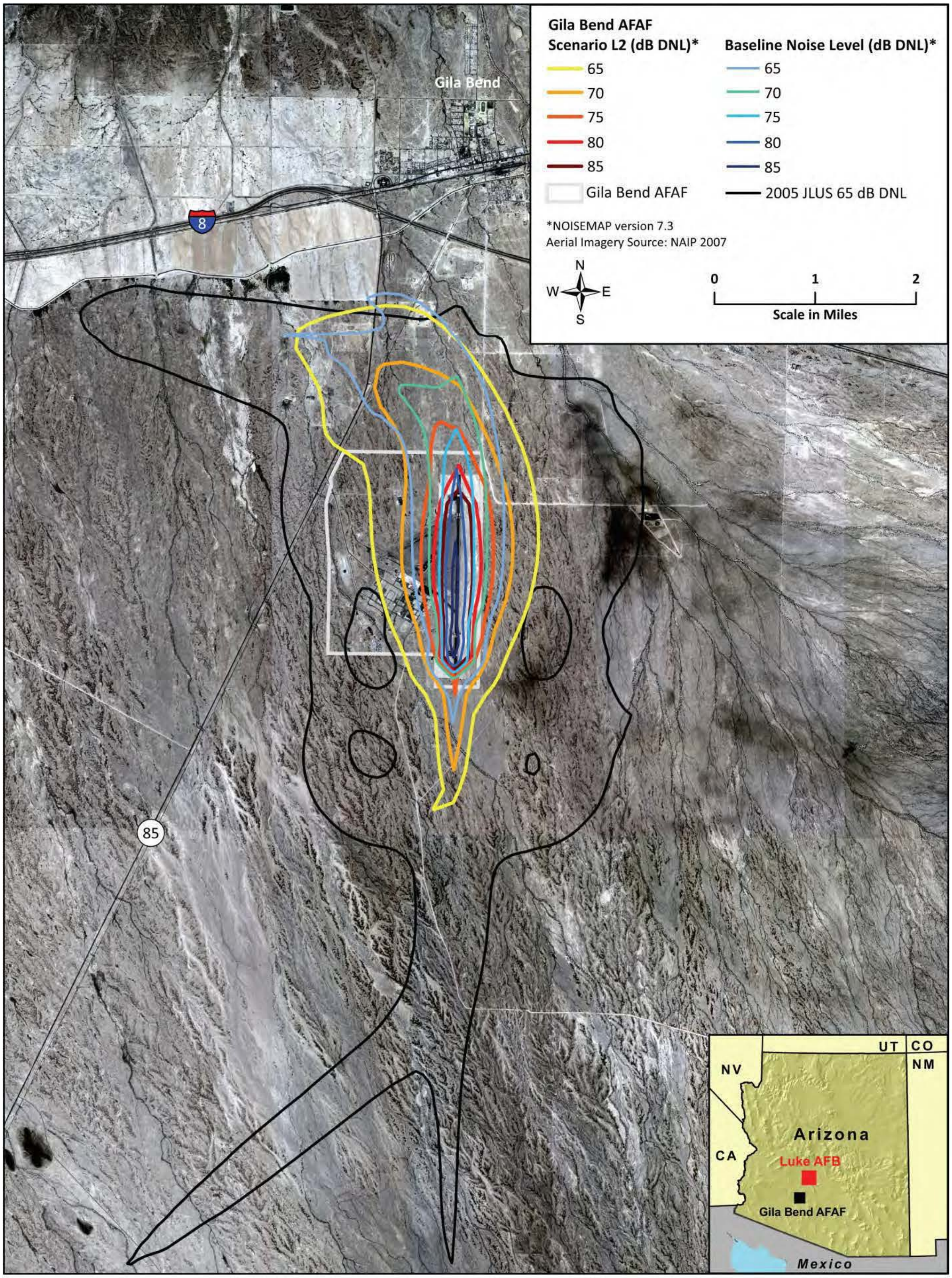


Figure LU 3.10–18. JLUS and Scenario L2 Noise Contours at Gila Bend AFAF

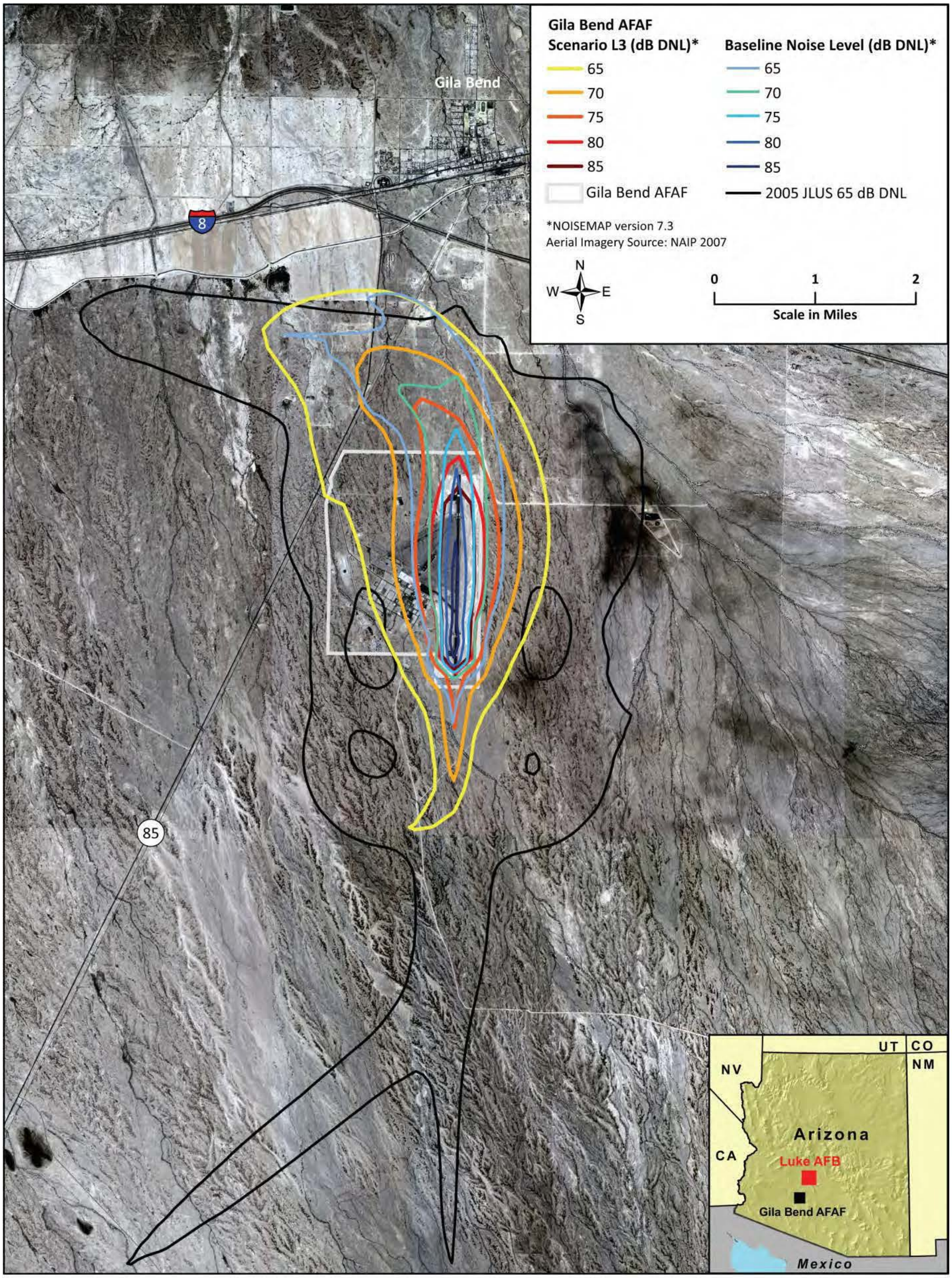


Figure LU 3.10–19. JLUS and Scenario L3 Noise Contours at Gila Bend AFAF

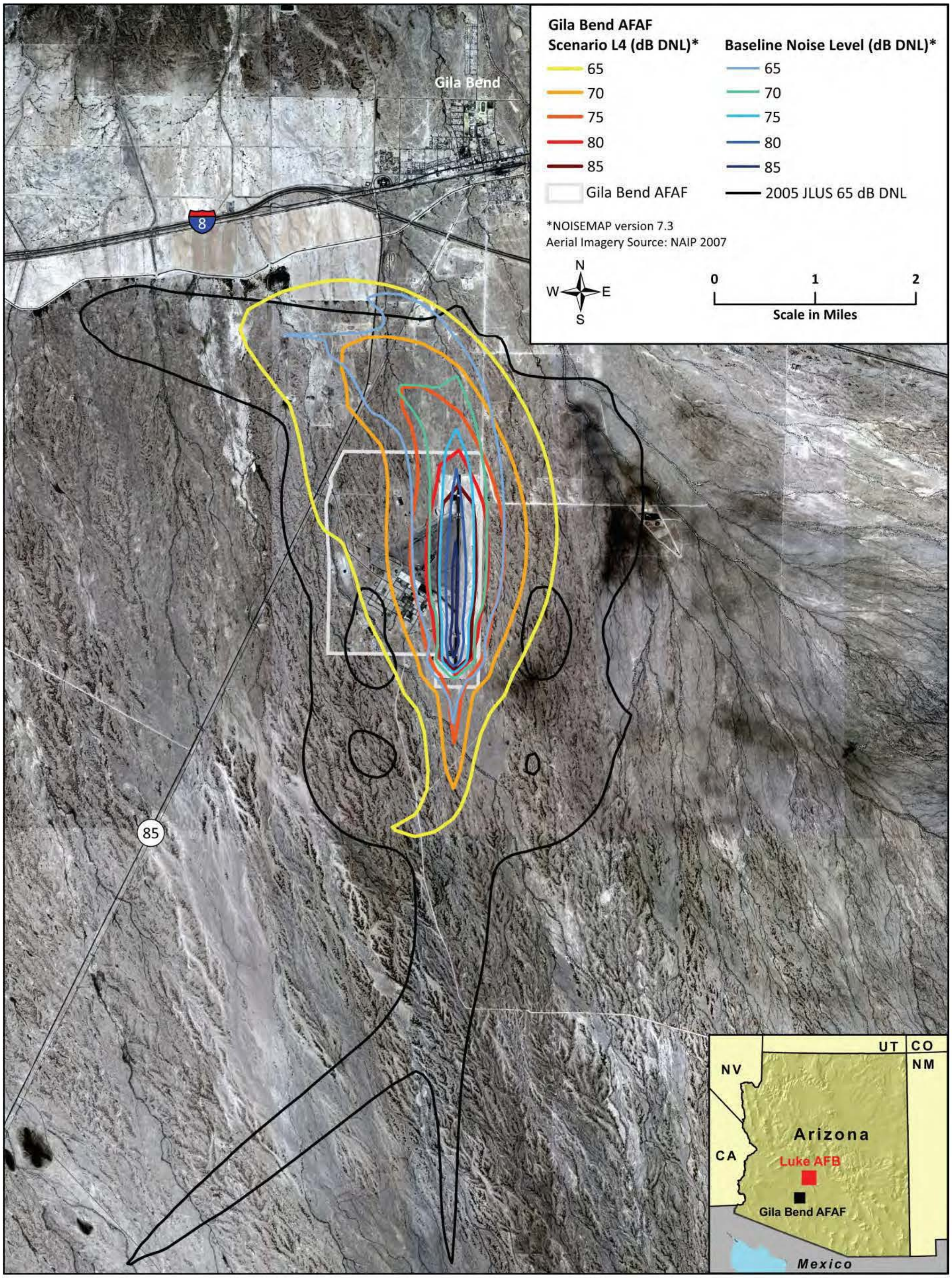


Figure LU 3.10–20. JLUS and Scenario L4 Noise Contours at Gila Bend AFAF

Approximately 461 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L5 (see Figure LU 3.10–21).

Scenario L6. As presented in Table LU 3.2–10, Scenario L6 would increase the area surrounding Gila Bend AFAF within the 65 dB DNL or greater noise contour by 3,864 acres compared with baseline conditions. The estimated increase in the number of persons affected by noise levels greater than 65 dB DNL would be 12 (see Figure LU 3.10–22).

Approximately 612 acres outside of the 65 dB DNL or greater JLUS noise contours would be affected by noise levels between 65 and 69 dB DNL under Scenario L6.

Recreation

A synopsis of issues and methodology for addressing potential impacts from military training on recreational resources underlying training airspace are provided in Chapter 3, Section 3.8.2. It also describes typical recreational impacts common to all scenarios. More specific changes affecting recreational resources for this staging location are provided below.

Areas underlying the Luke AFB F-35A primary use airspace have a similar mixture of public lands and undeveloped private ranch land, as described in Section LU 3.10.2.1. The public lands support a spectrum of recreational opportunities and activities, with some areas having particular qualities or recreational purposes. The following subsections highlight the effect under the various scenarios for Luke AFB.

In general, a diverse range of active and passive recreational activities occurring throughout the region already coexists within a context of some exposure to military overflight. Increased average noise levels and increased numbers of operations would result in higher probability that recreational participants experience noise and startle effects from these activities. This could cause some degradation in enjoyment for those affected and loss of opportunity for quiet recreational environments in the region. Because training operations would generally occur on weekdays at Luke AFB, noise from training would generally be lower on weekends than indicated below.

Increased noise could diminish opportunities for visitors to experience natural soundscapes in national park units, and could similarly diminish the qualities of natural quiet that are intrinsic to recreational opportunities in wilderness areas, WSAs, and other remote locations. Table LU 3.10–9 lists special use areas with high recreational value or opportunity underlying the primary use airspace and the current and projected average noise level under each F-35A aircraft scenario. In addition to the areas listed in Table LU 3.10–9, several WSAs provide important recreational opportunities throughout the affected region and are listed in Table LU 3.10–6. Table LU 3.10–10 indicates the current and projected number of daily operations for each airspace unit under each scenario.

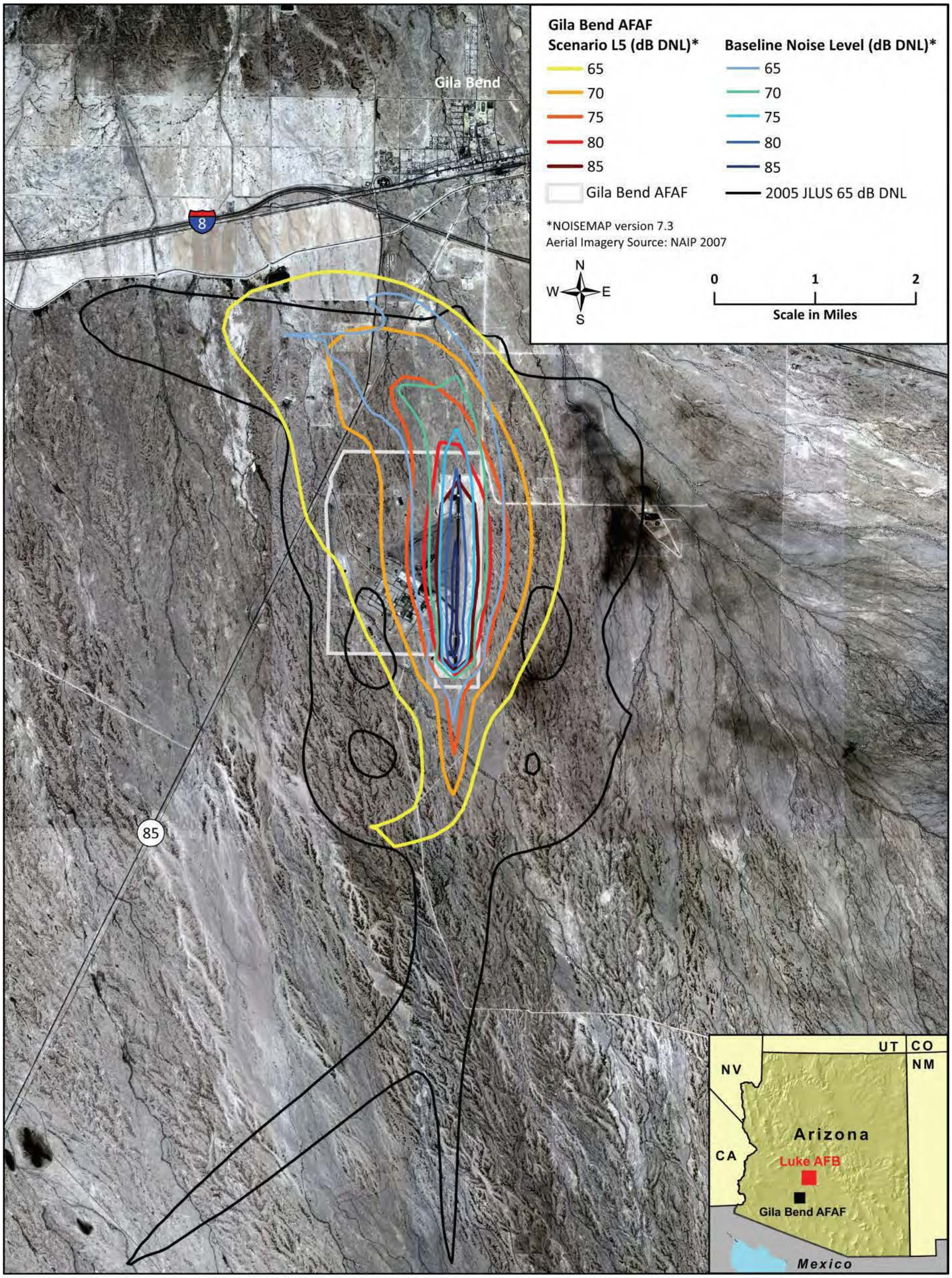


Figure LU 3.10–21. JLUS and Scenario L5 Noise Contours at Gila Bend AFAF

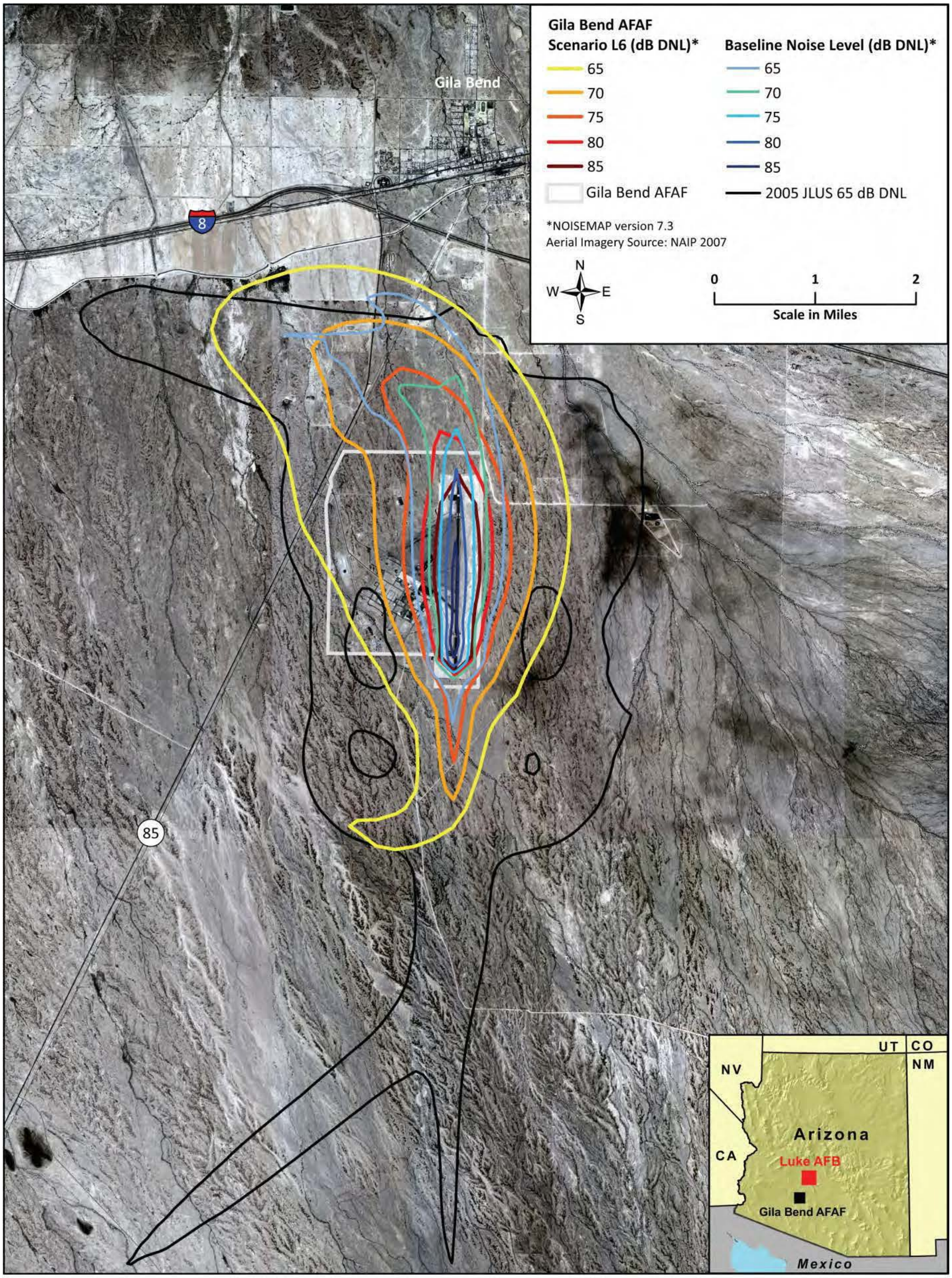


Figure LU 3.10–22. JLUS and Scenario L6 Noise Contours at Gila Bend AFAF

Table LU 3.10–9. Average Noise Levels by Airspace and Associated Recreational Use Areas[1]

Airspace	*Recreational Resource*	*Baseline Conditions*	*Noise Level (dB DNL_{mr})* L1 (24)	L2 (48)	L3 (72)	L4 (96)	L5 (120)	L6 (144)
Gladden/Bagdad MOAs/ATCAAs	Alamo Lake SP, Arrastra Mountain Wilderness, Aubrey Peak Wilderness, Big Horn Mountain Wilderness, Bill Williams NWR, East Cactus Plain Wilderness, Harcuvar Mountain Wilderness, Harquahala Mountains Wilderness, Hummingbird Springs Wilderness, Rawhide Mountains Wilderness, Swansea Wilderness, Tres Alamos Wilderness, Upper Burro Creek Wilderness	< 45	45	48	50	51	52	53
Sells MOA/ATCAA	Baboquivari Peak Wilderness, Cabeza Prieta NWR, Organ Pipe Cactus NM, Organ Pipe Cactus Wilderness	< 45	< 45	47	49	50	51	52
R-2301E Air-to-Air Area	Cabeza Prieta NWR and Wilderness, Organ Pipe Cactus Wilderness	55	58	61	62	64	65	65
VR-239	Agua Fria NM, Hells Canyon Wilderness, Hellsgate Wilderness, Horseshoe Reservoir, Ironwood Forest NM, Lake Pleasant RP, Mazatzal Wilderness, Needle's Eye Wilderness, Pichacho Peak SP, Salt River Canyon Wilderness	< 45	54	57	58	60	61	61
VR-245	Aubrey Peak Wilderness, Eagletail Mountains Wilderness, Hassayampa River Canyon Wilderness, Hells Canyon Wilderness, Lake Pleasant RP, Rawhide Mountains Wilderness	< 45	54	57	58	60	61	61
VR-223	Ironwood NM, South Maricopa Mountains Wilderness, Tohono O'odham Indian Reservation	47	49	52	53	55	55	56
VR-231	Big Horn Mountains Wilderness, Eagletail Mountains Wilderness, Hummingbird Springs Wilderness	47	49	52	53	54	55	56
VR-241	Agua Fria NM, Apache Lake, Bartlett Reservoir, Castle Creek Wilderness, Four Peaks Wilderness, Hells Canyon Wilderness, Horseshoe Reservoir, Ironwood Forest NM, Mazatzal Wilderness, Pichacho Peak SP, Prescott National Forest, Superstition Wilderness, Theodore Roosevelt Lake, Tohono O'odham Indian Reservation, Tonto National Forest, Tonto NM, White Canyon Wilderness	< 45	< 45	< 45	45	47	47	48
VR-242	Arrastra Mountain Wilderness, Eagletail Mountains Wilderness, Harcuvar Mountains Wilderness, Hassayampa River Canyon Wilderness, Hells Canyon Wilderness, North Maricopa Mountains Wilderness, Prescott National Forest, Signal Mountain Wilderness, South Maricopa Mountains Wilderness, Tres Alamos Wilderness, Woolsey Peak Wilderness	< 45	< 45	< 45	45	47	47	48

Airspace	Recreational Resource	Baseline Conditions	Noise Level (dB DNL_{mr})					
			L1 (24)	L2 (48)	L3 (72)	L4 (96)	L5 (120)	L6 (144)
VR-243	Aubrey Peak Wilderness, Castle Creek Wilderness, Eagletail Mountains Wilderness, East Cactus Plain Wilderness, Hassayampa River Canyon Wilderness, Hells Canyon Wilderness, Hualapai Mountain Park, Prescott National Forest, Rawhide Mountains Wilderness, Swansea Wilderness, Wabayuma Peak Wilderness	< 45	< 45	< 45	45	47	47	48
VR-244	Apache Lake, Bartlett Reservoir, Cabeza Prieta NWR, Castle Creek Wilderness, Four Peaks Wilderness, Hells Canyon Wilderness, Horseshoe Reservoir, Ironwood Forest NM, Mazatzal Wilderness, Organ Pipe Cactus NM, Organ Pipe Cactus Wilderness, Pichaco Peak SP, Prescott National Forest, Superstition Wilderness, Theodore Roosevelt Wilderness, Tohono O'odham Indian Reservation, Tonto National Forest, Tonto NM, White Canyon Wilderness	< 45	< 45	< 45	46	47	48	48

[1] Does not include list of WSAs.
Key: NM=national monument; RP=regional park; SP=state park; NWR=National Wildlife Refuge.

Overall, operations and noise levels would gradually increase in areas underlying MOAs by from about 1 dB DNL_{mr} under Scenario L1 up to about 7 or 8 dB under Scenario L6, but noise levels would remain below 55 dB DNL_{mr}. Operations would decline in the restricted airspace over BMGR, but noise levels would increase by 3 dB under Scenario L1 up to 10 dB under Scenario L6. This reflects the louder engine and power settings used by the F-35A. Two MTRs, VR-239 and VR-245, would experience substantial increases in noise from less than 45 dB under baseline conditions to a 16 dB increase under Scenario L6 (gradually increasing under the interim scenarios). This represents a high degree of change, which would be a noticeable difference for quiet wilderness and remote areas listed in Table 3.10–9. However, the frequency of overflights (of less than 2 per day under Scenario L6) is very low. Overflights (especially at low levels in MTRs) could startle and annoy individuals using these recreational areas, but occurrences would be infrequent.

For VR-223 and VR-231, sorties (and overflights) would decrease under all alternatives, although noise levels would increase by 2 dB (up to 49 dB DNL_{mr}) under Scenario L1 up to by 9 dB under Scenario L6. The remaining MTRs (VR-241, -242, -243, and -244) would experience a reduction in sorties and overflights and a minor increase (up to a 3 dB increase under Scenario L6) to 48 dB DNL_{mr}. These changes would not be perceptible to most recreational users and fewer overflights would tend to be the dominant (favorable) factor, since fewer overflights would result in fewer intrusive experiences.

Under all scenarios, individual operations by F-35A aircraft would be noticeably louder than F-16 aircraft (120 dB compared with 111 dB), with a higher probability of annoyance to affected persons by any given low-level overflight. Even so, recreational opportunities would be mostly unchanged in parks, developed sites, and pristine wilderness areas. Also, training would mostly occur on weekdays, with only occasional activity on weekends, when more people engage in recreational activities.

Sonic booms are projected to decrease from current levels under all primary training airspace units. This would benefit recreational resources by reducing the potential for the startle effect from sonic booms that can interfere with or disrupt a recreational event or individual experience.

Scenario L1. Under this scenario, noise level decreases and increases would be 3 dB or less beneath all primary training airspace units except for two MTRs. VR-239 and VR-245 would experience noticeable increases in noise levels (of 9 dB), even though only one sortie (on average) would fly the routes each day. This is due to the louder engine and power settings used by the F-35A. Although this may only occur once on any given day, persons in underlying areas, particularly any of the numerous wilderness areas, may be annoyed by very loud intrusive noise. There would be little change to underlying recreational resources under this scenario (and possibly some benefit from lower noise levels). While average levels below 45 dB under the MOAs and MTRs are compatible with recreation, the underlying areas would still be prone to the loud noise from individual overflights. Low-level sorties on MTRs are most likely to produce startle effects associated with low-level, fast-moving aircraft. Individual operations by F-35A aircraft would be noticeably louder than F-16 aircraft (120 dB compared with 111 dB), with a higher probability of annoyance to affected persons. Even so, recreational opportunities would be mostly unchanged in parks, developed sites, and pristine wilderness areas. Also, training would mostly occur on weekdays, with only occasional activity on weekends, when more people engage in recreational activities.

Table LU 3.10–10. Daily Operations by Airspace and Associated Recreational Use Areas[1]

Airspace	*Recreational Resource*	*Baseline Conditions*	*Daily Sortie-Operations* L1 (24)	L2 (48)	L3 (72)	L4 (96)	L5 (120)	L6 (144)
Gladden/Bagdad MOA/ATCAA Complex	Alamo Lake SP, Arrastra Mountain Wilderness, Aubrey Peak Wilderness, Big Horn Mountain Wilderness, Bill Williams NWR, East Cactus Plain Wilderness, Harcuvar Mountain Wilderness, Harquahala Mountains Wilderness, Hummingbird Springs Wilderness, Rawhide Mountains Wilderness, Swansea Wilderness, Tres Alamos Wilderness, Upper Burro Creek Wilderness	39	18	29	42	53	65	77
Sells MOA/ATCAA	Baboquivari Peak Wilderness, Cabeza Prieta NWR, Organ Pipe Cactus NM, Organ Pipe Cactus Wilderness	47	30	35	42	46	52	57
R-2301E	Cabeza Prieta NWR and Wilderness, Organ Pipe Cactus NM	49	44	26	41	31	34	36
VR-239	Agua Fria NM, Hells Canyon Wilderness, Hellsgate Wilderness, Horseshoe Reservoir, Ironwood Forest NM, Lake Pleasant RP, Mazatzal Wilderness, Needle's Eye Wilderness, Pichacho Peak SP, Salt River Canyon Wilderness	1	< 1	< 1	1	1	< 2	< 2
VR-245	Aubrey Peak Wilderness, Eagletail Mountains Wilderness, Hassayampa River Canyon Wilderness, Hells Canyon Wilderness, Lake Pleasant RP, Rawhide Mountains Wilderness	< 1	< 1	< 1	< 1	1	1	< 2

Airspace	*Recreational Resource*	*Baseline Conditions*	*Daily Sortie-Operations*					
			L1 (24)	L2 (48)	L3 (72)	L4 (96)	L5 (120)	L6 (144)
VR-223	Ironwood NM, South Maricopa Mountains Wilderness, Tohono O'odham Indian Reservation	4	< 1	< 1	1	1	< 2	< 2
VR-231	Big Horn Mountains Wilderness, Eagletail Mountains Wilderness, Hummingbird Springs Wilderness	< 4	< 1	< 1	1	1	1	< 2
VR-241	Agua Fria NM, Apache Lake, Bartlett Reservoir, Castle Creek Wilderness, Four Peaks Wilderness, Hells Canyon Wilderness, Horseshoe Reservoir, Ironwood Forest NM, Mazatzal Wilderness, Pichacho Peak SP, Prescott National Forest, Superstition Wilderness, Theodore Roosevelt Lake, Tohono O'odham Indian Reservation, Tonto National Forest, Tonto NM, White Canyon Wilderness	< 1	< 1	< 1	< 1	< 1	< 1	< 1
VR-242	Arrastra Mountain Wilderness, Eagletail Mountains Wilderness, Harcuvar Mountains Wilderness, Hassayampa River Canyon Wilderness, Hells Canyon Wilderness, North Maricopa Mountains Wilderness, Prescott National Forest, Signal Mountain Wilderness, South Maricopa Mountains Wilderness, Tres Alamos Wilderness, Woolsey Peak Wilderness	< 1	< 1	< 1	< 1	< 1	< 1	< 1
VR-243	Aubrey Peak Wilderness, Castle Creek Wilderness, Eagletail Mountains Wilderness, East Cactus Plain Wilderness, Hassayampa River Canyon Wilderness, Hells Canyon Wilderness, Hualapai Mountain Park, Prescott National Forest, Rawhide Mountains Wilderness, Swansea Wilderness, Wabayuma Peak Wilderness	< 1	< 1	< 1	< 1	< 1	< 1	< 1
VR-244	Apache Lake, Bartlett Reservoir, Cabeza Prieta NWR, Castle Creek Wilderness, Four Peaks Wilderness, Hells Canyon Wilderness, Horseshoe Reservoir, Ironwood Forest NM, Mazatzal Wilderness, Organ Pipe Cactus NM, Organ Pipe Cactus Wilderness, Pichaco Peak SP, Prescott National Forest, Superstition Wilderness, Theodore Roosevelt Wilderness, Tohono O'odham Indian Reservation, Tonto National Forest, Tonto NM, White Canyon Wilderness	< 2	< 1	< 1	< 1	< 1	< 1	< 1

[1] Does not include list of WSAs.

Scenario L2. Impacts under Scenario L2 would be similar to those described under Scenario L1. The frequency of operations would still be lower than baseline conditions in all primary training airspace units. Noise levels would increase by about 2 to 3 dB in MOAs (to about 47 dB DNL_{mr}) and by about 6 dB under R-2301E, a noticeable increase. VR-239 and VR-245 would experience a substantial 12 dB DNL_{mr} increase, while VR-231 and VR-223 would experience a 5 dB DNL_{mr} increase. The increased loudness of the individual operations may be noticeable to some persons who are familiar with the current level of loudness, but the number of annoying events would likely not increase, nor the likelihood of experiencing a disturbing event in a

recreational setting. An increase in DNL_{mr} under the R-2301E Air-to-Air Area of 6 dB (up to 61 DNL_{mr}) would be noticeable but compatible with dispersed outdoor recreation.

Scenario L3. Impacts under Scenario L3 would be similar to those described under Scenarios L1 and L2. This scenario continues the trend of more operations (becoming more in line with current levels in MOAs and MTRs) and noticeably higher average noise levels in all training airspace except VR-242, -243, and -244. Under the Gladden/Bagdad MOA/ATCAA Complex, certain areas with recreational value that are wholly or mostly under the airspace would experience 5 dB increases up to 50 dB DNL_{mr}, including Aubrey Peak, Swansea, East Cactus Plains, Harcuvar, Harquahala, and Rawhide Mountain Wilderness Areas and Alamo State Park. Similarly, substantial increases in average noise (of about 13 dB DNL_{mr}) beneath VR-239 and VR-245 would affect Horseshoe Reservoir and Pichaco Peak State Park and five wilderness areas. These changes are substantial and not consistent with preserving naturalness and opportunities for pristine and remote recreational experiences. Most of Lake Pleasant Regional Park also underlies both of these MTRs.

Scenario L4. Under Scenario L4, increases in average noise levels would be 5 dB DNL_{mr} in Sells MOA/ATCAA and 6 dB DNL_{mr} in Gladden/Bagdad MOA/ATCAA Complex. Increases of up to 15 dB DNL_{mr} would also occur in VR-239 and VR-245; increases of 7 or 8 dB DNL_{mr} would occur in VR-223 and VR-231 (up to about 55 dB DNL_{mr}). These significant gains would be very noticeable and would progressively change quiet environments to ones that have predictable, intermittent noise intrusion, particularly for five wilderness areas and Ironwood National Monument.

A 36 percent increase in the frequency of operations would also become evident in Gladden/Bagdad MOA/ATCAA Complex to those who are familiar with the area. Individual operations would be noticeably louder than F-16 aircraft, with a higher probability of annoyance to people who are affected while participating in recreational activities.

Scenario L5. Scenario L5 continues the trend described under Scenario L4, with increasingly fewer quiet environments that are free from manmade intrusions. This would have the greatest impact on wilderness areas and recreational activities that benefit from quiet surroundings. A large amount of public land under the training airspace provides for remote and quiet recreational opportunities. These areas would experience a progressive change from increasing noise; however, areas with desired qualities would remain, and opportunities in other locations within the region would still be available.

A 7 dB DNL_{mr} increase in areas beneath Sells MOA/ATCAA (up to 51 dB DNL_{mr}) and higher operations levels than baseline conditions, would affect Baboquivari Wilderness and Organ Pipe Cactus National Monument and Wilderness, which wholly or mostly underlie the Sells MOA/ATCAA. About a quarter of the monument's 1.4 million visitors use it for a recreational purpose (NPS 2010).

Scenario L6. Scenario L6 represents the highest projected level of change. Daily sorties would double in the Gladden/Bagdad MOA/ATCAA Complex (up to an average of 77 per day), with an 8 dB increase in noise levels (but remaining below 55 dB DNL_{mr}). Additional overflights, although not all low level, represent a noticeable moderate adverse impact for areas underlying these MOAs. Increases of up to 16 dB DNL_{mr} beneath the centerlines of VR-245 and VR-239 (increasing to 61 dB DNL_{mr}) and 8 dB DNL_{mr} beneath VR-223 and VR-231 (increasing to 56 dB DNL_{mr}) would substantially change the noise environment in underlying areas. VR-241, -242, -243, and -244 would experience a minor 3 dB increase (up to 48 dB DNL_{mr}), with fewer operations than under baseline conditions.

Noise would mostly be experienced as individual overflights affecting particular individuals, but the likelihood of personal exposure to one or more loud events while engaging in recreational activities under any of the training airspace elements would be high. Cabeza Prieta NWR and Wilderness, wholly under R-2301E, would experience up to a 10 dB increase (up to 65 dB DNL_{mr}) at this level of operations. This area is very remote and inaccessible, so the frequency of public impact would be relatively low. However, these noise levels are not generally consistent with wilderness qualities.

Auxiliary Airfields

Aux-1. Operations by F-35A aircraft at Aux-1 would decrease the area exposed to 65 dB DNL off the installation by about 1,340 acres under Scenario L6 and by up to 5,400 acres under Scenario L1. This area includes small and isolated residential areas west of Whittman, but no public recreational parks or amenities. Consequently, there would be no impact on public or commercial recreational resources under any of the F-35A aircraft scenarios at Aux-1. There may be positive impacts on any casual and incidental recreational uses occurring in this area.

Gila Bend AFAF. An increase of land exposed to noise levels above 65 dB DNL (ranging from a 250-acre increase under Scenario L1 to about a 3,860-acre increase under Scenario L6) would have minimal impact on recreational uses or activities in areas surrounding Gila Bend AFAF. Much of this land is privately owned and does not have developed recreational amenities. Consequently, there would be no impact on public or commercial recreational resources under any of the F-35A aircraft scenarios at the Gila Bend AFAF.

LU 3.11 Socioeconomics

LU 3.11.1 Base

The ROI for socioeconomics for the Luke AFB alternative is defined as Maricopa County, Arizona, and the communities immediately surrounding Luke AFB, as listed in Table LU 3.11–1. Potential socioeconomic consequences from the F-35A training activities would be concentrated within the county and, more particularly, within these communities. The definition of socioeconomic resources and methodology for analysis are described in Chapter 3, Section 3.9.

Table LU 3.11–1. Population Growth, 2000–2010

Location	*Census 2000*	*Census 2010*	*Average Annual Percentage Change 2000–2010*
Maricopa County	3,072,149	3,817,117	2.2
Avondale	35,883	76,238	7.8
Buckeye	6,537	50,876	22.8
El Mirage	7,609	31,979	15.4
Glendale	218,812	226,721	0.4
Goodyear	18,911	65,276	13.2
Litchfield Park	3,810	5,476	3.7
Peoria	108,364	154,065	3.6
Phoenix	1,321,045	1,445,632	0.9
Sun City CDP[1]	38,309	37,499	(0.2)
Surprise	94,899	117,517	2.2
Tolleson	4,974	6,546	2.8
Total ROI Cities	1,859,153	2,217,825	2.0
Arizona	5,130,632	6,392,017	2.2

[1] Sun City CDP is the combined area of Sun City and Sun City West.
(Number) denotes a negative number.
Source: USCB 2000a, 2010a.

LU 3.11.1.1 Base Affected Environment

Population. In 2010, Maricopa County was ranked as the most populated county in Arizona, with a total of 3,817,117 persons, and accounted for approximately 60 percent of the total population of Arizona (see Table LU 3.11–1) (USCB 2010a). There are 25 incorporated municipalities in Maricopa County. Communities closest to Luke AFB include Litchfield Park; Surprise; Buckeye; Avondale; Goodyear; Tolleson; Peoria; Glendale; El Mirage; and the Sun City Census Designated Place (CDP), which includes Sun City and Sun City West. These communities compose the ROI cities. Information is presented for these cities where recent data are available. The total population of these ROI cities in 2010 was over 2.2 million persons. Phoenix is the county seat and is also the capital and largest city in Arizona, with a 2010 population of over 1.4 million. Luke AFB supports approximately 5,900 military and civilian personnel and more than 76,000 family members and military retirees per year (Luke AFB 2010a).

Housing. Table LU 3.11–2 shows housing growth in Maricopa County and the ROI cities. The area has experienced rapid rates of growth in the number of housing units between 2000 and 2010. The number of housing units in the ROI cities totaled approximately 912,673 in 2010.

There are 598 homes in the family housing community on Luke AFB, as well as dormitories (Air Force 2010b).

Table LU 3.11–2. Housing Units, 2000–2010

Location	*Census 2000*	*Census 2010*	*Average Annual Percentage Change 2000–2010*
Maricopa County	1,250,231	1,639,279	2.7
Avondale	11,412	27,001	9.0
Buckeye	2,365	18,207	22.6
El Mirage	3,150	11,326	13.7
Glendale	79,645	90,505	1.3
Goodyear	6,663	25,027	14.1
Litchfield Park	1,631	2,716	5.2
Peoria	42,669	64,818	4.3
Phoenix	495,793	590,149	1.8
Sun City CDP[1]	25,784	28,169	0.9
Surprise	16,307	52,586	12.4
Tolleson	1,482	2,169	3.9
Total ROI Cities	686,901	912,673	3.2
Arizona	2,189,189	2,844,526	2.7

[1] Sun City CDP is the combined area of Sun City and Sun City West.
Source: USCB 2000b, 2010a.

During scoping, several commenters expressed concern that the noise generated by the F-35A training at Luke AFB could adversely affect property values, particularly in those cities and towns in closest proximity to the base. In the state of Arizona, property values are determined based on the full cash value (market value) of the property. The market value is then input into state-mandated formulas to calculate the assessed value and then the primary and secondary property taxes. The market value is calculated as the amount a buyer would be willing to pay for the property at a given moment in time. Two similar properties could have different market values based on factors such as proximity to schools and shopping; quality of neighboring properties; and neighborhood amenities, such as parks.

The recent recession and decline in housing values has had a severe impact on the real estate market and housing values, particularly in Maricopa County. The recession has resulted in falling sales prices. These lower sales prices would be reflected in the comparable sales evaluation of the market value of properties and would result in lower property values.

Schools. There are 829 public schools in 57 school districts serving Maricopa County (ADE 2010). There were a total of 617,298 students enrolled in Maricopa County during fall 2008 (see Table LU 3.11–3) (ADE 2010). Table LU 3.11–3 lists the schools in the ROI cities that are the most likely to potentially receive new students due to the F-35A beddown scenarios. In the ROI cities, there are a total of 443 schools, with a combined enrollment of 370,736 students. The average student-to-teacher ratio of these schools is estimated to be 18.69. There are two school districts serving children that reside on Luke AFB, including the Dysart Unified School District, which serves Saguaro Manor, and Litchfield Elementary School District, which serves Ocotillo Manor. High school students attend schools in the Aqua Fria Union High School District (Luke IDS 2010).

Table LU 3.11–3. Schools in the ROI Cities, FY2008–2009

District	*Total Revenues (dollars)*	*Total Expenditures (dollars)*	*Fall 2008 Enrollment*	*Number of Schools*	*Students Per Staff*[1]	
					Admins	**Teachers**
Agua Fria Union High School	49,066,350	76,309,395	6,249	4	240.35	20.79
Alhambra Elementary	112,198,005	119,473,494	14,909	15	532.46	20.92
Avondale Elementary	47,781,784	51,830,674	6,404	8	297.86	18.67
Balsz Elementary	27,643,477	28,843,468	3,040	5	276.36	18.48
Buckeye Elementary	38,246,956	38,291,448	4,607	6	383.92	22.26
Buckeye Union High School	42,334,216	40,803,739	3,329	4	221.93	20.40
Cartwright Elementary	147,115,423	156,074,857	18,965	23	243.14	18.23
Creighton Elementary	69,340,359	68,405,600	7,391	10	223.9	16.94
Deer Valley Unified	292,825,706	296,212,562	36,888	38	458.24	18.99
Dysart Unified	214,951,627	216,229,649	24,316	23	368.42	19.74
Fowler Elementary	34,708,743	37,014,117	4,498	7	224.9	18.58
Glendale Elementary	111,043,749	117,050,995	13,704	17	291.57	19.43
Glendale Union High School	138,576,288	141,973,948	14,889	10	283.06	20.63
Isaac Elementary	68,812,877	70,143,183	7,967	13	230.93	18.21
Laveen Elementary	35,411,582	31,372,758	4,931	6	224.14	20.38
Liberty Elementary	26,619,970	28,829,984	3,849	5	359.72	16.59
Litchfield Elementary	75,664,693	75,170,130	10,046	12	410.04	20.7
Littleton Elementary	40,965,964	44,948,695	5,190	7	288.33	16.39
Madison Elementary	54,808,020	61,210,426	5,759	8	287.95	19.4
Maricopa County Regional	7,131,566	4,494,459	328	9	164.00	14.64
Murphy	23,200,739	24,804,178	2,552	4	108.6	19.19
Osborn Elementary	35,602,672	37,914,459	3,482	6	290.17	15.88
Palo Verde Elementary	4,517,563	4,514,364	452	1	150.67	16.74
Paradise Valley Unified	304,538,470	317,038,621	33,848	47	399.62	17.83
Pendergast Elementary	83,984,112	86,135,052	10,554	14	351.80	18.46
Peoria Unified	300,376,995	312,355,317	38,116	39	395.89	18.21

District	Total Revenues (dollars)	Total Expenditures (dollars)	Fall 2008 Enrollment	Number of Schools	Students Per Staff[1]	
					Admins	Teachers
Phoenix Elementary	106,274,088	94,825,411	8,183	16	343.82	17.06
Phoenix Union High School	296,179,490	306,887,384	25,182	16	347.82	16.95
Riverside Elementary	7,637,305	9,940,352	769	2	219.71	21.36
Roosevelt Elementary	102,145,738	106,806,393	11,739	21	239.57	17.06
Tolleson Elementary	28,243,122	25,732,945	2,918	4	208.43	18.47
Tolleson Union High School	85,027,371	79,445,808	8,987	6	8987	21.11
Union Elementary	12,041,812	11,381,310	1,758	3	288.2	21.44
Washington Elementary	24,824,033	24,509,045	23,700	32	403.69	17.49
Wilson Elementary	18,298,775	19,072,655	1,237	2	247.4	16.49
Total ROI	**3,068,139,640**	**3,166,046,875**	**370,736**	**443**	**542.67**	**18.69**

[1] Students per staff for the total ROI represent the average number of administrative staff and average number of teachers over all school districts in the ROI.
Source: ADE 2010.

Total Employment. Total employment in Maricopa County in 2008 was 2,310,410 jobs. Between 2006 and 2008, employment grew at an average annual rate of approximately 0.6 percent. The retail industry accounts for the largest share of total employment in Maricopa County, with 262,753 jobs; followed by government and government enterprises, particularly on the state and local levels, with 237,810 jobs; and administrative and waste services, with 215,740 jobs (BEA 2010).

The military industry is one of the largest industries in the state of Arizona and has an annual economic impact of $9 billion (Air Force 2010b). The economic impact of Luke AFB on Arizona's economy is approximately $2.17 billion per year, which includes $653 million direct impact, $1.1 billion indirect impact, and $333 million induced impact (Air Force 2010b).

Public Services. Public services are provided by the county and city governments in Maricopa County, as well as other government agencies. Changes in population would affect the demand for these services, as well as the ability to fund them.

Tax revenues collected by the State of Arizona in FY2008–2009 totaled over $11.9 billion, including a combination of property taxes, sales taxes, and income taxes. In the same fiscal year, Maricopa County collected over $1.3 billion in tax revenues, and the City of Glendale, the largest city of the ROI cities, not including the city of Phoenix, collected over $259 million in tax revenues.

There are several police departments in Maricopa County that serve individual towns and cities. The Maricopa County Sheriff's Office serves Maricopa County and has 4,000 employees and 3,000 volunteers (MCSO 2010). Within the ROI cities discussed above, there are a total of 5,869 employees in the police departments, including officers and civilians (ADPS 2009).

There are approximately 13 fire districts and 19 fire departments in Maricopa County, Arizona (DFBLS 2009). Within the ROI cities, there are a total of 3,276 career firefighters, most serving the city of Phoenix (USFA 2010). There are also several fire departments that rely on volunteer firefighters. All of the ROI cities are members of the Automatic Aid System agreement. According to this agreement, the nearest emergency vehicle will respond to an emergency regardless of the jurisdiction of the emergency. Through this system, fire departments can respond to citizens' calls without concern for crossing city boundaries. The 56th Medical Group (56 MG) at Luke AFB is an outpatient-only Medical Treatment Facility. There are more than 600 personnel at the 56 MG, which serves more than 85,000 beneficiaries, including active-duty military members, retirees, and their families (Air Force 2010b). The number of medical professionals in the ROI cities and Maricopa County is not available.

LU 3.11.1.2 Base Environmental Consequences

Employment and Population. Potential socioeconomic impacts from construction expenditures and the change in personnel due to F-35A beddown are summarized in Table LU 3.11–4. The direct jobs listed under construction would be new construction-related jobs. The indirect and induced jobs created by the construction expenditures would be spread among a variety of industries supporting construction, such as supplies and materials, food services, and retail services. These construction jobs under each scenario would constitute less than 1 percent of the total employment in Maricopa County and are not likely to generate migration into the ROI. Construction expenditures and the jobs created would be temporary and would result in 2 to 3 years of stimulation to the local construction industry.

Under each F-35A aircraft scenario, the population change would constitute substantially less than a 1 percent change in the total population of the ROI cities listed in Table LU 3.11–1.

Table LU 3.11–4. Potential Socioeconomic Impacts, Scenarios L1 Through L6

	Scenario L1 (24 Aircraft)	*Scenario L2 (48 Aircraft)*	*Scenario L3 (72 Aircraft)*	*Scenario L4 (96 Aircraft)*	*Scenario L5 (120 Aircraft)*	*Scenario L6 (144 Aircraft)*
Construction (jobs)						
Direct	783	937	1,171	1,373	1,530	1,358
Indirect	324	388	484	568	633	562
Induced	425	508	635	745	830	737
Total	**1,532**	**1,833**	**2,290**	**2,686**	**2,993**	**2,657**
Population (persons)[1]						
Existing Conditions[3]	2,217,825	2,217,825	2,217,825	2,217,825	2,217,825	2,217,825
Direct	(1,278)	385	2,049	3,712	5,375	7,039
Total	**2,216,547**	**2,218,210**	**2,219,874**	**2,221,537**	**2,223,200**	**2,224,864**
Percentage Change	*(0.06)*	*0.02*	*0.09*	*0.17*	*0.24*	*0.32*
Employment (jobs)[2]						
Existing Conditions[4]	2,310,410	2,310,410	2,310,410	2,310,410	2,310,410	2,310,410
Direct	(379)	162	702	1,243	1,783	2,323
Induced	(161)	69	299	529	759	989
Total	**2,309,870**	**2,310,641**	**2,311,411**	**2,312,182**	**2,312,952**	**2,313,722**
Percentage Change	*(0.02)*	*0.01*	*0.04*	*0.08*	*0.11*	*0.14*

	Scenario L1 (24 Aircraft)	*Scenario L2 (48 Aircraft)*	*Scenario L3 (72 Aircraft)*	*Scenario L4 (96 Aircraft)*	*Scenario L5 (120 Aircraft)*	*Scenario L6 (144 Aircraft)*
Housing (units)[1]						
Existing Conditions[3]	1,639,279	1,639,279	1,639,279	1,639,279	1,639,279	1,639,279
Direct	(379)	162	702	1,243	1,783	2,323
Total	**1,638,900**	**1,639,441**	**1,639,981**	**1,640,522**	**1,641,062**	**1,641,602**
Percentage Change	*(0.02)*	*0.01*	*0.04*	*0.08*	*0.11*	*0.14*
Students (persons)[1]						
Existing Conditions[5]	370,736	370,736	370,736	370,736	370,736	370,736
Direct	(369)	158	685	1,211	1,738	2,265
Total	**370,367**	**370,894**	**371,421**	**371,947**	**372,474**	**373,001**
Percentage Change	*(0.10)*	*0.04*	*0.18*	*0.33*	*0.47*	*0.61*
Student-Teacher Ratio	18.69	18.69	18.69	18.69	18.69	18.69
Number of Potential New Teachers	–	8	37	65	93	121
Tax Revenues (million dollars)						
State and Local Taxes	(2.36)	1.01	4.36	7.73	11.09	14.44
Federal Taxes	(6.82)	2.91	12.63	22.36	32.07	41.78
Total	**(9.17)**	**3.92**	**16.99**	**30.09**	**43.16**	**56.23**
Law Enforcement (persons)[1]						
Existing Conditions[6]	5,869	5,869	5,869	5,869	5,869	5,869
Direct	–	1	5	10	14	19
Total	**5,869**	**5,870**	**5,874**	**5,879**	**5,883**	**5,888**
Percentage Change	*0.0*	*0.0*	*0.1*	*0.2*	*0.2*	*0.3*
Firefighters (persons)[1]						
Existing Conditions[7]	3,276	3,276	3,276	3,276	3,276	3,276
Direct	–	1	3	5	8	10
Total	**3,276**	**3,277**	**3,279**	**3,281**	**3,284**	**3,286**
Percentage Change	*0.0*	*0.0*	*0.1*	*0.2*	*0.2*	*0.3*

[1] Total of ROI cities listed in Table LU 3.11–1.
[2] Maricopa County ROI.
[3] Source: USCB 2010a.
[4] Source: BEA 2010.
[5] Source: ADE 2010.
[6] Source: ADPS 2009.
[7] Source: USFA 2010.
Note: (Number) denotes a negative number.

The unemployment rate in Maricopa County was 9.1 percent in 2010, with a total of 180,862 unemployed persons (BLS 2011). The degree of induced employment growth is such that the positions could be filled by unemployed persons currently in the county or by spouses of the incoming personnel without generating migration into the ROI. Under Scenario L6, the indirect and induced employment from the construction expenditures and the personnel change have the potential to reduce the unemployment rate to as low as 8.9 percent, all other variables being equal.

Housing. Assuming one household for each new member of Luke AFB personnel, the demand for housing would increase, as shown in Table LU 3.11–4. The housing market is not anticipated to be adversely affected by the increase in personnel at Luke AFB under any of the F-35A aircraft scenarios. Assuming that the on-base housing for Luke AFB is fully occupied, new F-35A personnel, including the F-35A students, would be dependent on the community for housing. The beddown of the F-35A would result in a demand for up to 2,093 housing units. The total number of vacant housing units in the ROI cities is approximately 46,575, not including over 75,000 vacant housing units in the city of Phoenix. Therefore, there is sufficient housing available in the ROI to accommodate the increase in F-35A personnel without adversely affecting the local housing market.

Schools. The number of school-aged dependents between the ages of 4 and 18 was estimated and listed as students in Table LU 3.11–4. The average student-to-teacher ratio for the schools in the ROI cities is 18.69 to 1. The addition of the students of F-35A personnel would likely result in the need for additional teachers, as listed in Table LU 3.11–4, depending on the resources available to the state and local governments. With the number of students being added, as well as the amount of state and local taxes generated by the personnel change, it is anticipated that the schools would have the capacity to accept the incoming students without impacting school resources.

Public Services. Provision of public services is dependent on the population needing the services and the ability of the state and local communities to provide those services, as supported by tax revenues. Using the Impact Analysis for Planning (IMPLAN) economic forecasting model, the amount of Federal, state, and local tax revenues generated by the increase in population and employment was estimated and is presented in Table LU 3.11–4.

The number of additional law enforcement officers and firefighters has been estimated by determining the existing proportion of these services to the current population. The estimated population increase under each F-35A aircraft scenario would potentially support the addition of between 1 and 19 law enforcement officers and between 1 and 10 firefighters. The number of law enforcement officers and firefighters hired by the state and local authorities would be dependent on the level of tax revenues collected and the level of service provided by the existing police officers and firefighters. The number of medical professionals in the ROI cities or Maricopa County is not available. However, the surrounding metropolitan area is large enough to support the medical needs of an estimated population increase of less than 1 percent, as projected under Scenarios L1 through L6. It is not anticipated that the population change would impact the provision of public services.

Noise. Airfield flight operations of the F-35A at Luke AFB are expected to increase the number of residents affected by noise levels greater than 65 dB DNL under Scenarios L4, L5, and L6, compared with the baseline flight operations (see Table LU 3.11–5). The number of residents affected by noise levels greater than 65 dB DNL would decrease under Scenarios L1, L2, and L3 compared with baseline conditions. Residents within the 65 dB DNL noise contour could be significantly affected by the increased noise. The impact of these noise levels as it relates to potential hearing loss is discussed in detail in Section LU 3.2.

Table LU 3.11–5. Estimated Residents Affected by Noise Levels Greater Than 65 dB DNL, Baseline Conditions and F-35A Beddown Scenarios

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario L1 (24 Aircraft)*	*Scenario L2 (48 Aircraft)*	*Scenario L3 (72 Aircraft)*	*Scenario L4 (96 Aircraft)*	*Scenario L5 (120 Aircraft)*	*Scenario L6 (144 Aircraft)*
Total ≥ 65	**1,601**	**200**	**488**	**1,181**	**2,223**	**3,216**	**5,340**
65–69	1,535	149	415	1,090	2,111	3,078	5,158
70–74	50	38	50	59	71	88	125
75–79	14	13	21	26	32	38	42
80–84	2	–	2	6	9	12	15
≥ 85	–	–	–	–	–	–	–

Source: USCB 2010a, as analyzed using GIS.

Property Values. Residential property values within the JLUS area and near Luke AFB already reflect disclosure requirements, which recognize the property location within the Arizona state defined high noise area (Hogan 2011). Since properties within the JLUS already reflect noise-related discount values, new impacts upon most properties would not be expected to occur. The noise generated by the F-35A could have an adverse impact on property values for those properties outside the JLUS line that would be newly exposed to noise levels above 65 dB DNL and especially for properties newly exposed to noise levels above 75 dB DNL, which the EPA considers incompatible with residential use. This potential adverse impact on property values may be considered a significant impact on those residents newly affected by noise levels above 75 dB DNL.

LU 3.11.2 Airspace

The ROI for socioeconomic resources under the airspace to be used by the F-35A includes the counties or the portions of the counties under the primary use airspace. Primary use airspace has been defined as airspace that would be used by the F-35A on a daily basis. Occasional use airspace would be used by the F-35A when the primary use airspace is unavailable. The occasional use airspace would be used infrequently; therefore, potential impacts on the areas underlying the occasional use airspace would be negligible. The definition of socioeconomic resources and methodology for analysis are described in Chapter 3, Section 3.9.

LU 3.11.2.1 Airspace Affected Environment

The F-35A would utilize the same airspace currently used by the F-16 training mission at Luke AFB. The primary use airspace for the F-35A includes the existing Gladden, Bagdad, and Sells MOAs/ATCAAs. The dimensions and use of this airspace are described in more detail in Section LU 3.1. The primary use airspace associated with BMGR East includes R-2301E and R-2304/R-2305.

Eight MTRs would be used by the F-35A as primary use airspace, as shown in Table LU 2.2–2; however, these airspace units represent only narrow corridors of airspace, which overlie only small portions of remote counties. No socioeconomic impacts are expected from the F-35A using these MTRs.

Because no new airspace or airspace modifications are proposed for the F-35A beddown, no additional population would be affected by training overflights. GIS and 2010 census data were used to estimate the population under the primary use airspace (see Table LU 3.11–6). No population centers are located beneath R-2301E or R-2304/R-2305; therefore, they are not listed in the table below.

Table LU 3.11–6. Population Under the Proposed F-35A Primary Use Airspace at Luke AFB

Airspace Units	*Counties Overflown*	*Affected Population (2010)*	*Total Population of Counties Overflown (2010)*	*Percentage of Total County Population*
Bagdad MOA/ATCAA	La Paz County	3,667	20,489	0.8
	Mohave County		200,186	
	Yavapai County		211,033	
Gladden MOA/ATCAA	La Paz County	7,590	20,489	0.2
	Maricopa County		3,817,117	
	Mohave County		200,186	
	Yavapai County		211,033	
Sells MOA/ATCAA	Maricopa County	8,623	3,817,117	0.2
	Pima County		980,263	
	Pinal County		375,770	

Source: USCB 2010a, as analyzed using GIS.

In addition to use of airspace and BMGR, F-35A aircraft at Luke AFB would use two auxiliary airfields for certain training events. These auxiliary airfields have been identified as Aux-1 and Gila Bend AFAF.

Aux-1 is located approximately 15 miles from Luke AFB in western Maricopa County. As stated in Section 3.11.1.1, the 2010 population of Maricopa County, which includes the Phoenix metropolitan area, was 3,817,117, an increase from the 2000 population of 3,072,149. Western Maricopa County and the area surrounding Aux-1 is not as developed or urban as the area immediately surrounding Luke AFB. The nearest community to Aux-1 is Wittmann, Arizona (zip code 85361), an unincorporated community with a population of 763 persons, according to the 2010 census. Housing units in Wittmann numbered 301 units in 2010. Noise levels greater than 65 dB DNL currently affect an estimated 711 persons in the vicinity of Aux-1.

Gila Bend AFAF is located approximately 3 miles south of the town of Gila Bend in southern Maricopa County at the edge of the BMGR. Gila Bend AFAF currently supports a variety of aircraft, including F-16s operating in BMGR. As stated above, the 2010 population of Maricopa County, which includes the Phoenix metropolitan area, was 3,817,117. The 2010 population of the town of Gila Bend was 1,922 persons, a decrease from the 2000 population of 1,980 (USCB 2000a, 2010a). Noise levels between 65 and 70 dB DNL currently affect an estimated 3 persons in the vicinity of Gila Bend AFAF.

LU 3.11.2.2 Airspace Environmental Consequences

F-35A aircraft using the airspace units listed in Table LU 3.11–6 would be governed by the same regulations and guidelines as the aircraft currently using the airspace. Supersonic operations would only take place above the minimum altitudes designated for each airspace unit. Flight safety guidelines are discussed in Section LU 3.4. The population under the primary use airspace units is currently exposed to military aircraft overflights and supersonic operations. The population density under each airspace unit is relatively low, at less than 4 persons per square mile for each airspace unit, compared with the average population density of 45.2 persons per square mile for the state of Arizona.

Noise levels in the airspace are discussed in more detail in Section LU 3.2. Table LU 3.2–6 presents the primary use airspace units under each aircraft scenario and the resulting change in noise levels from projected F-35A flight operations. Noise levels in the Gladden and Bagdad MOA/ATCAA Complex would increase from less than 45 dB DNL_{mr} up to as high as 53 dB DNL_{mr} under Scenario L6. Noise levels within the Sells MOA/ATCAA would increase from 45 dB DNL_{mr} up to 52 dB DNL_{mr} under Scenario L6. While noise levels in these airspace units would not exceed 55 dB DNL_{mr}, the change would likely be noticed by residents living below the airspace and could result in annoyance. However, the change in noise levels is not expected to adversely affect economic decisions, property values, or other socioeconomic resources in the areas underlying the airspace.

The BMGR restricted airspace currently experiences noise levels greater than the 55 dB DNL_{mr}. However, with an active bombing range and public lands beneath the restricted airspace, private residences are not located under the airspace. Therefore, private residences are not impacted by these noise levels and would not be affected by noise levels generated by the F-35A.

Table LU 3.11–7 presents the estimated number of residents in the vicinity of Aux-1 and Gila Bend AFAF that would be exposed to noise levels greater than 65 dB DNL under baseline conditions and F-35A aircraft scenarios. As discussed in Section LU 3.11.1.2, the noise generated by the F-35A training operations at Aux-1 or Gila Bend AFAF could have an adverse impact on property values for properties newly exposed to noise levels greater than 65 dB DNL and especially for properties newly exposed to noise levels above 75 dB DNL, which the EPA considers incompatible with residential use. This potential adverse impact on property values may be considered a significant impact on those residents newly affected by noise levels above 75 dB DNL.

Table LU 3.11–7. Residents Affected by Noise Levels Greater Than 65 dB DNL, Aux-1 and Gila Bend AFAF

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario L1 (24 Aircraft)*	*Scenario L2 (48 Aircraft)*	*Scenario L3 (72 Aircraft)*	*Scenario L4 (96 Aircraft)*	*Scenario L5 (120 Aircraft)*	*Scenario L6 (144 Aircraft)*
Aux-1							
Total ≥ 65	**710**	**125**	**250**	**327**	**488**	**647**	**802**
65–69	588	90	189	223	336	455	574
70–74	111	17	34	70	110	144	173
75–79	7	8	12	16	21	25	30
80–84	4	6	7	8	9	10	11
≥ 85	0	4	8	10	12	13	14
Gila Bend AFAF							
Total ≥ 65	**3**	**1**	**5**	**9**	**11**	**13**	**15**
65–69	3	1	5	8	10	11	12
70–74	–	–	–	1	1	2	3
75–79	–	–	–	–	–	–	–
80–84	–	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–	–

Source: USCB 2010a, as analyzed using GIS.

LU 3.12 Environmental Justice and Protection of Children

LU 3.12.1 Base

The ROI for environmental justice and protection of children is defined as the region in which there is the potential for adverse impacts from construction or flight operations. This region includes the area potentially impacted by high noise levels. In accordance with the *Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process* (Air Force 1997b), the ROI is compared with the community of comparison, which is defined as Maricopa County. The definition of environmental justice and methodology for analysis are described in Chapter 3, Section 3.10.

LU 3.12.1.1 Base Affected Environment

The analysis of environmental justice for the base and vicinity considers changes in airfield noise levels caused by the F-35A beddown scenarios. The existing area affected by noise levels from Luke AFB is depicted in Figure LU 3.2–1. Using 2010 census data, the number of persons affected by off-base noise from Luke AFB was estimated. Under baseline conditions, an estimated 1,600 persons are affected by noise levels greater than 65 dB DNL (see Section LU 3.12.1.2, Table LU 3.12–2). Of these persons affected, approximately 50.0 percent are minorities and 10.0 percent are low income.

Table LU 3.12–1 identifies total population and percentage populations of concern in Maricopa County, which serves as the community of comparison required for environmental justice analysis, as well as in the state of Arizona and the United States. The total population in 2010 for Maricopa County was 3,817,117 persons, representing approximately 60 percent of Arizona's population (6,392,017 persons).

Table LU 3.12–1. Total Population and Populations of Concern, 2010

Location	*Total Population*	*Percentage Minority*	*Percentage Low-Income*	*Percentage Youth*
Maricopa County	3,817,117	41.3	13.4	26.4
Arizona	6,392,017	42.2	14.7	25.5
United States	308,745,538	36.3	13.5	24.0

Source: USCB 2010a, 2010b.

Minority persons represent 41.3 percent of the total population in Maricopa County and 42.2 percent of the state population. The minority population at the national level is 36.3 percent. Persons categorized as Hispanic or Latino were the predominant minority group, with 30.0 percent of the total population in Maricopa County and the state level.

The percentage of persons and families in Maricopa County with incomes below the poverty level was lower than state levels, averaging 13.4 percent in the county, compared with 14.7 percent in Arizona.

The youth population, comprising children under the age of 18 years, constitutes 26.4 percent of the Maricopa County population, compared with 25.5 percent for Arizona overall, and 24.0 percent for the Nation. No schools are currently affected by noise levels greater than 65 dB DNL from Luke AFB baseline operations. The child care center located on Luke AFB is affected by noise levels between 65 and 69 dB DNL. No off-base child care centers are currently affected by noise from Luke AFB.

LU 3.12.1.2 Base Environmental Consequences

No disproportionately high and adverse human health or environmental effects on minority or low-income populations have been identified as a result of construction activities on Luke AFB. Construction would occur within the Luke AFB cantonment area and would not affect off-base populations.

Residents within the 65 dB DNL noise contour could be significantly affected by the increased noise. Table LU 3.12–2 lists the estimated population affected by noise levels greater than 65 dB DNL under each aircraft scenario, as well as the estimated share of minority and low-income populations affected.

As described in Section LU 3.12.1.1, in Maricopa County, which is defined as the community of comparison, the minority population constitutes 41.3 percent of the total population, and the low-income population constitutes 13.4 percent. The affected minority and low-income populations are comparable to the minority and low-income populations in the community of comparison under F-35A aircraft Scenarios L3 through L6. However, under Scenarios L1 and L2, the affected minority population is higher than the community of comparison. The affected low-income population under these scenarios is comparable to the low-income population in the community of comparison. Therefore, under Scenarios L1 and L2, noise levels from Luke AFB would present a disproportionately high and adverse environmental impact on minority populations.

Table LU 3.12–2. Populations of Concern Affected by Noise Levels Greater Than 65 dB DNL

	Total Affected Population (2010)	*Number (Percentage) Minority*		*Number (Percentage) Low-Income*	
Baseline Conditions	1,600	791	(49.4)	175	(11.0)
Scenario L1 (24 Aircraft)	199	123	(61.4)	24	(12.1)
Scenario L2 (48 Aircraft)	487	262	(53.7)	59	(12.1)
Scenario L3 (72 Aircraft)	1,181	454	(38.4)	143	(12.1)
Scenario L4 (96 Aircraft)	2,223	856	(38.5)	267	(12.0)
Scenario L5 (120 Aircraft)	3,215	1,262	(39.3)	384	(11.9)
Scenario L6 (144 Aircraft)	5,341	1,583	(29.6)	684	(12.8)

Source: USCB 2010a, 2010b, as analyzed using GIS.

Schools and child care centers are considered compatible with noise levels up to 75 dB DNL with additional noise attenuation. For noise levels above 75 dB DNL, educational services are not compatible regardless of noise attenuation. Additionally, these noise levels are not compatible with outdoor use and could contribute to hearing loss in children regularly exposed to aircraft noise.

Under Scenario L1, no schools would be affected by noise levels greater than 65 dB DNL. Under Scenarios L2 through L4, one school would be affected by noise levels between 65 and 69 dB DNL. Under Scenarios L5 and L6 two schools would be affected by noise levels between 65 and 69 dB DNL. The on-base child care centers would be affected under Scenarios L3 through L6 by noise levels between 65 and 69 dB DNL. No off-base child care centers would be affected by noise levels greater than 65 dB DNL under Scenarios L1 through L4. Two off-base child care centers would be affected by noise levels between 65 and 69 dB DNL under Scenarios L5 and L6.

Therefore, the noise levels generated under the F-35A aircraft scenarios in regard to schools and child care centers would have potential adverse impacts on children at these locations. Because noise levels at these locations would be below 75 dB DNL, these facilities could be made compatible with additional noise attenuation to address the potential adverse impacts. Additional detail concerning noise and the potential for interference with learning in terms of ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI 2009) is provided in Section LU 3.2, Noise.

LU 3.12.2 Airspace

The ROI for environmental justice and protection of children under the airspace to be used by the F-35A includes the counties or the portions of the counties under the primary use airspace. Primary use airspace has been defined as airspace that would be used by the F-35A on a daily basis. Occasional use airspace would be used by the F-35A when the primary airspace is unavailable. The occasional use airspace would be used infrequently; therefore, potential impacts on the areas underlying the occasional use airspace would be negligible. The definition of environmental justice and methodology for analysis are described in Chapter 3, Section 3.10.

LU 3.12.2.1 Airspace Affected Environment

The number of minority and low-income individuals and persons under the age of 18 under the primary use airspace was estimated using GIS analysis of 2010 census data. This information is provided in Table LU 3.12–3. Portions of the Tohono O'odham Nation are located under the Sells MOA/ATCAA and portions of the Tohono O'odham Nation, the White Mountain Apache, and the San Carlos Apache tribes are located under VR-239, contributing to a higher proportion of minority and low-income persons compared with the populations that underlie the other airspace units. VR-223 also overlies the Tohono O'odham Nation. No population centers are located under R-2301E or R-2304/R-2305; therefore, those airspace units are not listed in Table LU 3.12–3.

Table LU 3.12–3. Populations of Concern Under the Primary Use Airspace

Airspace Units	*Counties Overflown*	*Total Affected Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
Bagdad MOA/ATCAA	La Paz County	3,667	819	22.3	507	13.8	666	18.2
	Mohave County							
	Yavapai County							
Gladden MOA/ATCAA	La Paz County	7,590	1,593	21.0	1,006	13.3	1,149	15.1
	Maricopa County							
	Mohave County							
	Yavapai County							
Sells MOA/ATCAA	Maricopa County	8,623	7,344	85.2	3,026	35.1	2,546	29.5
	Pima County							
	Pinal County							
VR-239	Maricopa County	25,356	9,689	38.2	4,423	17.4	6,397	25.2
	Yavapai County							
	Gila County							
	Graham County							
	Pima County							
	Pinal County							
VR-245	Maricopa County	4,373	1,491	34.1	861	19.7	955	21.8
	Yuma County							
	La Paz County							
	Mohave County							
	Yavapai County							
VR-223	Maricopa County	3,039	2,342	77.1	1,016	33.4	628	20.7
	Pima County							
	Pinal County							
VR-231	Maricopa County	5,889	2,205	37.4	712	12.1	1,455	24.7
	La Paz County							
	Yuma County							

Airspace Units	*Counties Overflown*	*Total Affected Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
VR-241	Yavapai County	14,717	4,024	27.3	1,898	12.9	3,024	20.5
	Maricopa County							
	Gila County							
	Pima County							
	Pinal County							
VR-242	Yavapai County	11,591	3,681	31.8	1,921	16.6	1,873	16.2
	La Paz County							
	Maricopa County							
VR-243	Yavapai County	9,586	2,331	24.3	1,663	17.3	1,676	17.5
	Mohave County							
	La Paz County							
	Yuma County							
	Maricopa County							
VR-244	Yavapai County	13,937	4,139	29.7	2,005	14.4	2,851	20.5
	Maricopa County							
	Gila County							
	Pima County							
	Pinal County							

Source: USCB 2010a and 2010b, as analyzed using GIS.

As part of the environmental justice analysis, the minority, low-income, and youth populations are presented for the communities of comparison, which are represented by the counties and states in which the airspace is located. This information is presented in Table LU 3.12–4.

Table LU 3.12–4. Communities of Comparison Under the Primary Use Airspace and Auxiliary Airfields

Community of Comparison	*Total Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
Gila County	53,597	18,299	34.1	10,333	19.3	11,471	21.4
Graham County	37,220	17,737	47.7	7,049	18.9	10,575	28.4
La Paz County	20,489	7,635	37.3	4,037	19.7	3,678	18.0
Maricopa County	3,817,117	1,577,062	41.3	509,685	13.4	1,007,861	26.4
Mohave County	200,186	40,808	20.4	30,933	15.5	41,265	20.6
Pima County	980,263	438,563	44.7	154,185	15.7	225,316	23.0
Pinal County	375,770	155,284	41.3	52,083	13.9	99,700	26.5
Yavapai County	211,033	38,065	18.0	26,714	12.7	40,269	19.1
Yuma County	195,751	126,729	64.7	38,932	19.9	55,185	28.2
Arizona	6,392,017	2,696,370	42.2	941,594	14.7	1,629,014	25.5

Source: USCB 2010a, 2010b.

In addition to the populations of concern under the airspace, the populations of concern were evaluated in the vicinity of the auxiliary airfields Aux-1 and Gila Bend AFAF. The focus of the environmental justice analysis for the auxiliary airfields is the area potentially adversely affected by noise contours. Figures LU 3.2–7 through LU 3.2–18 present the noise contours for Aux-1 and Gila Bend AFAF.

Both Gila Bend AFAF and Aux-1 are located in Maricopa County. Therefore, the community of comparison is Maricopa County, as listed in Table LU 3.12–4. Under the existing conditions, noise levels above 65 dB DNL affect an estimated 711 persons at Aux-1 and an estimated 3 persons at Gila Bend AFAF (see Section LU 3.12.2.2, Table LU 3.12–5). Of the 711 persons affected at Aux-1, approximately 14.6 percent are minorities and 7.8 percent are low income. Of the 3 persons affected by noise levels greater than 65 dB DNL at Gila Bend AFAF, none are minorities and 28.0 percent are low-income. There are no schools in the vicinity of either auxiliary airfield affected by noise levels greater than 65 dB DNL. Information on child care centers is not available.

LU 3.12.2.2 Airspace Environmental Consequences

Portions of the Tohono O'odham Nation are located under the Sells MOA/ATCAA, VR-239, and VR-223. Further discussions of these tribes are provided in Section LU 3.9. Noise levels in the primary use airspace under all Luke AFB F-35A aircraft scenarios, with the exception of VR-223, would not result in disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or children living under the airspace because the noise levels generated in the Gladden and Bagdad MOA/ATCAA Complex and the Sells MOA/ATCAA under all scenarios would not exceed 65 dB DNL. VR-223 is estimated to overlie a disproportionately minority and low-income population as compared to the counties as a whole included beneath the MTR. With noise levels on VR-223 increasing from 47 dB DNL_{mr} up to as high as 56 dB DNL_{mr} under Scenario L6, disproportionately high and adverse impacts on minority and low-income populations may be expected from F-35A training on VR-223. Noise levels in R-2301E would increase to above 65 dB DNL; however, no population centers are located under this airspace unit.

Noise levels at Aux-1 and Gila Bend AFAF would increase compared with baseline noise levels. Table LU 3.12–5 lists the number and percentage of minority and low-income populations affected by noise levels greater than 65 dB DNL under each F-35A aircraft scenario. No schools in the vicinity of Aux-1 and Gila Bend AFAF are anticipated to be affected by noise levels greater than 65 dB DNL under the baseline or F-35A aircraft scenarios. Information was not available on child care centers in the vicinity of the two auxiliary airfields.

As described in Section LU 3.12.2.1, Maricopa County is the community of comparison for both auxiliary airfields. Minority persons in Maricopa County constitute 41.3 percent of the total population; low-income persons constitute 13.4 percent. The estimated share of affected populations of concern under each of the F-35A aircraft scenarios is lower than or comparable to the populations of concern in Maricopa County. Therefore, no disproportionately high and adverse impacts on minority or low-income populations in the vicinity of Aux-1 or Gila Bend AFAF are anticipated.

Table LU 3.12–5. Populations of Concern Affected by Noise Levels Greater Than 65 dB DNL, Aux-1 and Gila Bend AFAF

	Total Affected Population (2010)	*Number (Percentage) Minority*		*Number (Percentage) Low-Income*	
Aux-1					
Baseline Conditions	711	175	(24.6)	55	(7.7)
Scenario L1 (24 Aircraft)	126	29	(23.2)	2	(1.8)
Scenario L2 (48 Aircraft)	250	65	(26.1)	19	(7.6)
Scenario L3 (72 Aircraft)	327	87	(26.5)	25	(7.6)
Scenario L4 (96 Aircraft)	487	122	(25.1)	38	(7.8)
Scenario L5 (120 Aircraft)	648	157	(24.2)	50	(7.7)
Scenario L6 (144 Aircraft)	803	190	(23.7)	62	(7.7)
Gila Bend AFAF					
Baseline Conditions	3	0	(0.0)	1	(33.3)
Scenario L1 (24 Aircraft)	1	0	(0.0)	–	(0.0)
Scenario L2 (48 Aircraft)	5	1	(20.0)	–	(0.0)
Scenario L3 (72 Aircraft)	9	1	(11.1)	2	(22.2)
Scenario L4 (96 Aircraft)	11	1	(9.1)	3	(27.3)
Scenario L5 (120 Aircraft)	13	2	(15.4)	4	(30.8)
Scenario L6 (144 Aircraft)	15	2	(13.3)	4	(26.7)

Source: USCB 2010a, 2010b, as analyzed using GIS.

LU 3.13 Infrastructure

LU 3.13.1 Base

LU 3.13.1.1 Base Affected Environment

Potable Water System. Potable water for Luke AFB is supplied by a series of seven groundwater wells. The withdrawal and use of future groundwater is governed by the 1980 Arizona Groundwater Management Act. Luke AFB is within the White Tank and Grand Avenue Planning Area of Maricopa County, which is within the Phoenix Active Management Area. The Arizona Department of Water Resources has established additional restrictions on groundwater uses within the Phoenix Active Management Area (Luke AFB 2002). Groundwater in most areas of Luke AFB is more than 200 feet below ground surface. The recently enacted Arizona Water Bank Program could affect future groundwater use. Designed to store unused Colorado River water underground, the water bank may provide a reserve water supply to cities if the future allocation of Colorado River water is reduced (Air Force 2006b). Luke AFB is also incorporating the LEED [Leadership in Energy and Environmental Design] green building rating system in the design and construction of future buildings (Luke AFB 2007a).

Water supply infrastructure at the base includes groundwater wells, transmission and distribution main networks, well pump stations, booster pump stations, a single aboveground storage tank reservoir (0.5-million-gallon capacity), and two elevated storage tanks, each with a 0.5-million-gallon capacity. Potable water consumption for calendar year 2009 at Luke AFB was 424.58 million gallons.

Sanitary Sewer System. The base wastewater system is a separate system and consists of four major elements: the sanitary sewer collection system, lift station and forced main infrastructure, the wastewater treatment plant (WWTP), and the non-potable water reuse system. Wastewater outflows generated from Luke AFB and off-base infrastructure and assets are received by the sanitary sewer collection system, which gravity drains to a series of lift stations. The lift stations subsequently pump the wastewater through forced main transmissions, discharging to a 21-inch-diameter reinforced-concrete pipe gravity main that provides primary inflow to the head of the WWTP. The WWTP has a design capacity of 1.2 million gallons per day (MGD) and a peak flow capacity of 2.5 MGD. The plant currently processes approximately 0.31 MGD. In previous years, the plant processed up to 0.5 MGD. The plant is located approximately 2 miles east of the base along Glendale Avenue, from Litchfield Road to El Mirage Road.

WWTP operations have the option to either store treated wastewater in the plant's effluent holding pond (250,000-gallon capacity) or discharge treated wastewater to the Agua Fria River. Permit requirements will supersede irrigation needs for instance, treated water will be discharged to the river if reclaimed water permit conditions are exceeded. Treated effluent from the plant is classified as reclaimed water (Class A, *Arizona Administrative Code* Title 18) (Arizona 2008) and is currently used for irrigation purposes.

Treated water discharged to the Agua Fria River is conveyed through a metered outfall designated as Outfall 001. The outfall flow is metered with a Parshall Flume that includes two points of compliance: the first at Monitoring Well No. 101 and the second at the south boundary of the plant effluent holding pond.

Treated water used for irrigation purposes is pumped from the plant's effluent holding pond to the base holding pond located near Building No. 1107 (Veterinary Clinic). From the base holding pond, treated water is further pumped by demand basis to the base and/or to the Falcon Dunes Golf Course holding pond.

Permits associated with the operation of the WWTP are approved under ADEQ. These permits include the following:

- AZPDES Permit No. AZ0110221
- Type 2 Reclaimed Water General Permit – Class A
- Aquifer Protection Permit No. P-100563

Storm Water Drainage System. Luke AFB is designated as a small, regulated, nontraditional MS4, requiring that the base seek coverage under the ADEQ Phase II General Permit, which will be an AZPDES permit. In compliance with the ADEQ Phase II General Permit, the required Notice of Intent submittals have been appropriately filed. The primary entity that will implement or direct the implementation of the Storm Water Management Program will be the Luke AFB Environmental Element Office.

Additionally, Luke AFB operates under the EPA and ADEQ Phase I Storm Water Regulations and has an existing SWPPP that currently complies with the requirements of the EPA National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit issued under the Phase I regulations. Luke AFB is subject to Phase I Storm Water Regulations as a result of industrial operations at the base that fall into certain industrial-sector designations (hazardous

waste treatment, storage, and disposal facilities; landfills; scrap metal recycling facilities; land transportation; and air transportation facilities). The current Luke AFB Phase I NPDES permit is still regulated under EPA Region 9 until the current permit term expires. Upon expiration of the current Phase I permit, it will be reissued through the ADEQ and become an AZPDES permit. In addition to these SWPPP requirements that govern industrial operations, Luke AFB is subject to Phase II Storm Water regulations, which pertain to municipal-type storm water discharges, such as those related to buildings, roadways, and parking areas on base.

The Agua Fria River is the receiving stream for surface water runoff from the northern portion of Luke AFB. The southern portion of the base drains to Bullard Wash, which flows into the Gila River (Luke AFB 2002, 2007a).

Solid Waste Management. Solid waste is defined as a non-liquid and non-soluble material that includes municipal garbage and industrial waste. Examples of solid waste include demolition waste, sewage sludge, mining residues, or agricultural refuse. There are no operational landfills located within Luke AFB. Refuse and recyclable materials generated by base activities are collected by a contractor and transported off base to the Glendale Municipal Landfill (Luke AFB 2002).

Electrical System. Arizona Public Service (APS) supplies power to Luke AFB. The average yearly consumption is approximately 114,080 megawatt-hours. The incoming feed is rated 69 kilovolts and serves two 12,000/16,000 kilovolt-ampere, 67-12.47/7.2-kilovolt, three-phase step-down transformers located on the APS side of the substation. The transformers are protected on both the primary and secondary sides by main oil circuit breakers. This arrangement provides Luke AFB with two 12.47-kilovolt circuits. From the APS-owned circuit breakers, the two circuits enter the base-owned, metal-clad switchgear located on the Luke AFB side of the substation. The Luke AFB distribution system serves over 440 service connections for individual facilities.

The Luke AFB electrical distribution system consists of approximately 144,450 circuit linear feet of wire and cables rated at 12.47 kilovolts. The main power is supplied from the base-owned, metal-clad switch station through three-phase, four-wire distribution circuits. The electric distribution consists of 12.47-kilovolt three-phase distribution circuits that are both overhead on utility poles and underground in conduit. The system includes over 210 power poles, over 175 pad-mounted transformers ranging in size from 45 to 5,000 kilovolt-amperes, and over 215 pole-mounted transformers ranging in size from 5 to 75 kilovolt-amperes.

Natural Gas System. Southwest Gas Corporation provides odorized natural gas to Luke AFB through the two utility-owned regulator stations. The regulator stations are located at Facility 689 and Facility 1159. The regulator stations reduce the pressure to 20 pounds per square inch gauge (psig) before the gas enters the distribution system.

The Luke AFB natural gas distribution system consists of approximately 14 miles of buried piping, ranging in size from 1-inch service laterals to 6-inch gas mains. Natural gas is distributed to approximately 174 service connections (including 61 housing service connections for housing units not being considered for privatization). Some facilities have more than one connection. The system is mostly looped, allowing gas to back-feed from different directions. The main base system, which was mostly replaced with polyethylene in 1988, is essentially new,

with some isolated areas of 1960s- and 1970s-era steel piping. The Military Family Housing area distribution system is original steel piping from the 1960s. Overall, the piping is approximately 89 percent polyethylene and approximately 11 percent steel.

The main base's facilities are provided with natural gas at 20 psig. Each facility's service regulator further reduces the pressure from 20 psig to between 8 and 12 inches of water or to the pressure required by specific operations to meet equipment requirements within the facility.

LU 3.13.1.2 Base Environmental Consequences

Potable Water System. Under the F-35A aircraft scenarios, the largest net change in personnel associated with the change in mission would be an increase of approximately 7,041 personnel (including dependents); this would occur under Scenario L6. The most recent data regarding municipal water consumption for the Phoenix area indicate that municipal water use averages between 175 MGD and 400 MGD depending on the season (Phoenix 2010). With an average per capita household water use estimation of about 70 gallons per day (AWWA 2010), it is anticipated that additional personnel associated with Scenario L6 would result in an increase of approximately 492,870 gallons per day. This represents a potential increase of less than 1 percent of the lower end of the latest demand statistics. As a result, even under the largest aircraft scenario, the Air Force has not identified any significant impacts associated with potable water use (see Table LU 3.13–1).

Table LU 3.13–1. Percentage of Potential Increases in Potable Water/Wastewater

Aircraft Scenario	*Net Personnel Change (Including Dependents)*	*Volume of Water (Potable Water and Wastewater) Per Day (gallons)*	*Percentage of Potable Water Use Increase Over Baseline Conditions*	*Percentage of Wastewater Generation Increase Over Baseline Conditions*	
				Base WWTP	**City WWTP**
Scenario L1 (24 Aircraft)	(1,276)	–	–	–	–
Scenario L2 (48 Aircraft)	+386	27,020	+ < 1	+8.7	+ < 1
Scenario L3 (72 Aircraft)	+2,052	143,640	+ < 1	+46	+ < 1
Scenario L4 (96 Aircraft)	+3,714	259,980	+ < 1	+83	+ < 1
Scenario L5 (120 Aircraft)	+5,376	376,320	+ < 1	+121	+ < 1
Scenario L6 (144 Aircraft)	+7,041	492,870	+ < 1	+158	+ < 1

Note: (Number) denotes a negative number.

Sanitary Sewer System. The EPA estimates that the average person generates approximately 70 gallons of wastewater per day between showering, toilet use, and general water use (EPA 2005b). Potential increases in wastewater generation under each scenario are presented in Table LU 3.13–1. The Phoenix area has two WWTPs that treat a combined average of 250 MGD (Phoenix 2010). The Luke AFB WWTP has a capacity of 1.2 MGD. Increases in off-base wastewater generation would be less than 1 percent of current treatment statistics. Large increases in wastewater production for the base WWTP would occur under most scenarios were all personnel and their dependents to live on base. Even with these increases, the base WWTP would be able to meet these demands with the plant's current capacity. While it is unknown

whether the majority of personnel would reside on or off base, it is likely that personnel would be distributed in both locations, thereby reducing the potential impact on respective WWTPs.

Storm Water Drainage System. A high percentage of the active administrative and industrial areas of the installation are paved or roofed and exhibit high runoff coefficients. Drainage of the built-upon area is by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. The Agua Fria River is the receiving stream for surface-water runoff from the northern portion of Luke AFB. The southern portion of the base drains to Bullard Wash, which flows into the Gila River.

Luke AFB also operates under the EPA and ADEQ Phase I Storm Water Regulations and has an existing SWPPP that currently complies with the requirements of the EPA NPDES Multi-Sector General Permit issued under the Phase I regulations. Luke AFB is subject to Phase I Storm Water Regulations as a result of industrial operations at the base that fall into certain industrial-sector designations (hazardous waste treatment, storage, and disposal facilities; landfills; scrap metal recycling facilities; land transportation; and air transportation facilities).

Luke AFB has implemented an SWPPP (Luke AFB 2009b) to deal with any impacts that may occur during construction or operation under any of the F-35A aircraft scenarios.

Solid Waste Management. Luke AFB does not operate an onsite solid waste facility (landfill). All solid waste is collected and transported off site for disposal. Off-base contractors completing any demolition and construction projects at the Luke AFB installation would be responsible for disposing of waste generated by these activities. Contractors would be required to comply with Federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled, reused, or otherwise diverted from landfills. All non-recyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste, including waste contaminated with hazardous waste, asbestos-containing material (ACM), lead-based paint (LBP), or other undesirable components would be managed in accordance with AFI 32-7042, *Waste Management* (Air Force 2009c). Thus, only minor impacts on the solid waste management system at the Luke AFB installation are anticipated due to the proposed demolition and construction. Solid waste generated by the additional personnel associated with Scenarios L2 through L6 would be transported off site.

Electrical System. The demand for energy (primarily electricity) would increase during the demolition, construction, or operational phases under all of the F-35A aircraft scenarios. The Air Force has estimated that electrical use for 379,500 square feet of new or modified operations, training, and maintenance facilities would be 7,172,550 kilowatt-hours annually. To estimate the electrical use associated with personnel and their dependents, data from the U.S. Energy Information Administration (USEIA 2010) were used to identify that consumers averaged about 13,140 kilowatt-hours per person (2,528,405 users) in Arizona in 2008 (the best available statistics), with a total of about 33,223,241,700 kilowatt-hours consumed. At a maximum potential increase of 7,041 additional people under Scenario L6, a potential increase of about 92,492,460 kilowatt-hours of electricity can be anticipated. This represents less than 1 percent of total usage in 2008. Even under an optimal usage scenario, this increase is very small and not significant; scenarios of less than 144 aircraft are expected to result in fewer impacts. In

addition, the Air Force expects increases in electrical use associated with new facilities to be minimal, given LEED requirements for energy efficiency. The electrical energy supply grid at Luke AFB is adequate and would not be affected.

Natural Gas System. It is not anticipated that natural gas consumption would increase during the demolition and construction phases of the F-35A aircraft scenarios. As additional heated working and administrative spaces are developed and operations increase under the F-35A aircraft scenarios, the Air Force estimates that natural gas consumption could increase by 13,548,150 cubic feet. However, as with electrical consumption estimation, several variables that are not yet known affect consumption estimations. For residential consumption estimations, according to the U.S. Energy Information Administration (2010), approximately 1,128,264 residential consumers in Arizona used about 34,905 million cubic feet of natural gas in 2009. This equates to an average of about 0.03 million cubic feet per person per year. Under Scenario L6, the largest potential increase in people would be 7,041. Assuming all persons use natural gas, which is unlikely, the greatest potential increase in consumption would be 211 million cubic feet annually. This equates to an increase of less than 1 percent in natural gas usage, with this number likely being much less. Even under an optimal usage scenario, this increase is very small and not significant; scenarios of less than 144 aircraft are expected to result in fewer impacts.

LU 3.14 Transportation

LU 3.14.1 Base

LU 3.14.1.1 Base Affected Environment

Regional Access. Regional access to Luke AFB is provided by Interstates 10 and 17 and Arizona State Routes 101 and 303. Interstate 10, approximately 5 miles south of Luke AFB, continues west to its terminus in Los Angeles and east through New Mexico, Texas, and the Gulf states to an eastern terminus in Jacksonville, Florida. Luke AFB can be accessed from Interstate 10 through multiple interchanges in the city of Glendale. Interstate 17, approximately 14 miles east of Luke AFB, has a southern terminus in Phoenix and a northern terminus at Interstate 40 just north of Flagstaff. State Route 101, which loops around the greater Phoenix metropolitan area, is 5 miles to the east and provides access to the base via Northern Avenue and Glendale Avenue. State Route 303 passes just to the west of the installation boundary and provides base access via Northern Avenue and Camelback Road.

Direct access to the base is provided by Northern Avenue (running parallel to the northern base boundary), Glendale Avenue (access from the east), or Litchfield Street (running north–south, dividing the main base from the secured cantonment area). Luke AFB is located within the city limits of Glendale, Arizona. The secured cantonment area of Luke AFB is located south of Northern Avenue and west of Litchfield Road.

Phoenix Sky Harbor International Airport is a three-terminal facility, approximately 20 miles east of Luke AFB, that serves more than 100 cities (including destinations in Mexico, Canada, and Europe) with non-stop flights from 17 different commercial airlines. Approximately 1,200 aircraft arrive and depart each day from one of three runways. Sky Harbor is Arizona's primary airport and the largest commercial airport in the southwestern United States

(Sky Harbor 2010). Phoenix Goodyear Airport, located 8 miles from Luke AFB, provides general aviation relief to Phoenix Sky Harbor.

Public transportation is provided to the City of Glendale by Valley Metro, which provides bus and light rail service to the entire Phoenix metropolitan area. Valley Metro offers bus service directly to Luke AFB at a stop at the south gate. The nearest light rail stop to Luke AFB is just east of Interstate 17, approximately 15 miles east of the base, at Camelback Street and North 19th Avenue (Valley Metro 2010).

Gate Access. There are three access gates at Luke AFB, all located off Litchfield Avenue. The Base main gate is located just north of the intersection of Litchfield Road and Glendale Avenue at Thunderbird Street and is the point at which most traffic enters the installation. A second gate is located at the southeastern boundary of the main base, at the intersection of Litchfield Avenue and Super Sabre Street. A third gate is located at the northeastern part of the main base, at the intersection of Litchfield Avenue and Lightning Street.

On-Base Circulation. Major off-base arterial roads are Northern Avenue, Litchfield Street, and Glendale Avenue. On-base arterial roads include Eagle Street, Falcon Street, Thunderbird Street, Lightning Street, and Super Sabre Street (which provides access to the southern flight line). Corsair Avenue, a collector street, provides access to the northern flight line.

Several transportation management projects have been, or are being, implemented to enhance traffic flow, safety, and security on Luke AFB, including reconfiguration of several entry gates and construction of the Litchfield Road overpass at Thunderbird Street. Luke AFB experiences some degree of congestion during rush hours (Luke AFB 2002).

In May 2010, a Finding of No Significant Impact was issued by the Federal Highway Administration for the *Environmental Assessment for Northern Parkway*, a proposed improvement project for the existing Northern Avenue. The proposal involves the construction of a regional transportation corridor extending approximately 12 miles from State Route 303 to U.S. Route 60. In addition to the realignment of Northern Avenue, five new grade-separated intersections and two new bridges are planned in the vicinity of Luke AFB (FHWA 2010).

LU 3.14.1.2 Base Environmental Consequences

Construction-Related Impacts. Implementation of any of the six scenarios (Scenarios L1 through L6) would require delivery of materials to and removal of construction-related debris from construction and renovation sites. However, construction traffic would make up only a small portion of the total existing traffic volume in the area and at the installation. Increased traffic during construction could contribute to degradation of the internal road surfaces, congestion at the gates, and delays in the processing of access passes. The potential for short-term increases in traffic are not likely to substantially affect commute times. No long-term impacts on on- or off-base transportation systems would result.

Operations. Under Scenario L1, there would be a decrease in mission personnel reporting to the base, and under Scenario L2, there would be an increase of approximately 160 persons. Local traffic conditions would reflect these minor changes, and there would be no adverse effects on traffic flow. With the implementation of Scenario L3, there would be an increase of

approximately 700 persons, or less than a 10 percent increase in daily commuting traffic to and from the base. In addition to the increase in mission personnel, there would be a small increase in dependent and commercial traffic. This assumes that all personnel and dependents live off base, work standard workdays, and drive individually to the installation. The increase in the amount of vehicles passing through the three gates providing access to the base during the morning and evening workday rush hours would not be discernable. Therefore, implementation of Scenario L3 would be accommodated without increased congestion to the local transportation system.

If Scenario L4 is selected, personnel would increase by approximately 1,240, resulting in an 18 percent increase in full-time personnel reporting to work each day. This increase would result in a similar percentage increase in daily commuting traffic to and from Luke AFB. In addition to the increase in mission personnel, there would be a small increase in dependent and commercial traffic. This assumes that all personnel and dependents live off base, work standard workdays, and drive individually to the installation. This scenario could result in congestion at the three gates during the morning and evening workday rush hours.

With the selection of Scenario L5, personnel would increase by approximately 1,780, resulting in a 26 percent increase in full-time personnel reporting to work each day. This increase would result in a similar percentage increase in daily commuting traffic to and from Luke AFB. In addition to the increase in personnel, there would be a small increase in dependent and commercial traffic. This scenario would result in an increase in the congestion at the three base gates during the morning and evening workday rush hours. The installation may adjust the schedule of operations to accommodate this increase or provide additional personnel at the gate to process security checks during the peak hours. Therefore, implementation of Scenario L5 would be accommodated with these changes without increased congestion to the local highway system.

Under Scenario L6, personnel would increase by approximately 2,325, resulting in a 34 percent increase in full-time personnel reporting to work each day. This increase would result in a similar percentage increase in daily commuting traffic to and from Luke AFB. In addition to the increase in personnel, there would be a commensurate increase in dependent and commercial traffic. This scenario could result in an increase in the congestion at the three base gates during the morning and evening workday rush hours. The installation would adjust the schedule of operations to accommodate this increase or provide additional personnel at the gate to process security checks during the peak hours.

LU 3.15 Hazardous Materials and Waste

LU 3.15.1 Base

LU 3.15.1.1 Base Affected Environment

Hazardous Materials and Waste. Hazardous materials and petroleum products are used at Luke AFB during operations related to aircraft maintenance (e.g., corrosion control, fuel cell maintenance, and engine maintenance), ground vehicle maintenance (e.g., fluid changes, filter

changes, and minor painting), and facilities maintenance (e.g., structural maintenance, pesticide treatment, and utility maintenance).

Hazardous materials and petroleum products are used at Luke AFB during aircraft and facility maintenance operations and include antifreeze, petroleum products, oils, lubricants, fuels, oil filters, scrap metals, pesticides, cleaning solvents, respirator filter cartridges, sealants, adhesives, paints, flammable solids, etc. Releases of hazardous materials and petroleum products are managed in accordance with the *Hazardous Materials Emergency Planning and Response Plan* (Air Force 2000), the *Spill Prevention and Response Plan* (Air Force 1997b), and the *OPLAN 705*, dated September 18, 2007 (56th Fighter Wing, Luke AFB 2007b). These plans designate the procedures to be followed in the event of a release of hazardous substances of any type or form.

Hazardous waste management at Luke AFB adheres to Resource Conservation and Recovery Act regulations and is guided by the Luke AFB AFI 32-7001, *Hazardous Waste Management* (Luke AFB 2007b). This AFI establishes policies, assigns responsibilities, and provides guidance for proper management of hazardous waste. Luke AFB is regulated as a large-quantity generator of hazardous waste. The Air Force goal is to recycle resources for reuse when possible and economically feasible. Waste minimization and recycling are emphasized, with hazardous waste disposal as the last resort (Luke AFB 2005).

Luke AFB generates hazardous waste, including antifreeze, batteries, oils, stripping elements, and paint; pathology laboratory processes also generate waste. Hazardous waste generated at Luke AFB is stored on base in satellite storage areas prior to being transferred to on-base, 90-day storage areas until it is collected and managed by a contractor. Emergency spill cleanup equipment is available at each satellite location and at the Luke AFB Fire Department (Luke AFB 2002).

Small quantities of household hazardous materials (e.g., paints, household cleaners) may be used and stored within Luke AFB Military Family Housing areas. There are 690 Military Family Housing units located north and south of Glendale Avenue. Hazardous waste generated by Military Family Housing residents would be considered residential waste and would not be managed or regulated by the Luke AFB Hazardous Material Management Center (Luke AFB 2004).

Environmental Restoration Program. The Environmental Restoration Program (ERP) is part of a DoD effort to identify, evaluate, and remediate former disposal and spill sites at DoD facilities nationwide. The ERP (formerly known as the Installation Restoration Program) was established in 1975 and is conducted in accordance with Section 211 of the 1986 Superfund Amendments and Reauthorization Act and the Defense Environmental Restoration Program. Thirty-three sites at Luke AFB were identified for investigation under the ERP. Ten of these were found to require remedial action as ERP or area of concern sites while the other 23 sites required no further action and have no associated constraints. Some sites, have residential development, excavation, or concrete cap maintenance constraints that require special planning and construction considerations. The 10 sites have been investigated, and currently there are no active ERP sites under remediation at Luke AFB. Some ERP sites have long-term groundwater-monitoring requirements (Air Force 2005, 2006a).

Toxic Substances. Asbestos management at Luke AFB is performed in accordance with AFI 32-1052 LS1 (Luke Supplement), *Facility Asbestos Management* (Luke AFB 2008), which requires installations to develop an Asbestos Management Plan to document the current status and condition of ACM throughout the installation and document asbestos management efforts. This AFI also requires development of an Asbestos Operating Plan that describes how the installation will complete asbestos-related projects. Maricopa County has also implemented local asbestos regulations, known as Regulation III, Rule 370, Section 301.8, which requires inspection for the presence of asbestos in any building on Luke AFB that is going to be demolished within 12 months of the start of demolition activities. If ACMs are found to be present, Maricopa County must be notified, and the ACMs must be removed prior to demolition. An asbestos survey was completed for approximately 95 percent of the buildings on Luke AFB. Of those buildings surveyed, approximately 80 percent were identified as having ACMs (Luke AFB 2002c). During FY2009, a total of 344 cubic yards of ACMs were disposed of off site.

LBP management at Luke AFB is established in the Air Force policy and guidance on LBP in facilities, which incorporates, by reference, the requirements of 29 CFR Section 1910.1025 and Part 1926, 40 CFR Section 50.12 and Parts 240 through 280, the Clean Air Act and the Housing and Community Development Act of 1992 (Public Law 102-550), as well as other applicable Federal regulations. Luke AFB has developed a Lead-Based Paint Management Plan in accordance with this policy.

Luke AFB operates a Hazardous Material Management Center in Building 927. This center is a supply warehouse, and personnel there are responsible for the ordering, tracking, storage, distribution, and use of all hazardous materials on the base. The Hazardous Material Management Center regulates and controls the flow of hazardous materials at the base (Luke AFB 2002).

LU 3.15.1.2 Base Environmental Consequences

Hazardous Materials and Waste. Under the F-35A aircraft beddown scenarios, the quantities of hazardous materials and petroleum substances used throughout the Luke AFB installation may decrease in the long term. Short-term increases in the quantities of hazardous materials and petroleum substances are expected and would be realized in terms of the quantity of fuel stored and used during construction activities because various fuels (e.g., diesel, gasoline) would be required to run earthmoving equipment and power tools and to provide electricity and lighting as conditions warrant. In addition, the number of sites storing, using, and handling hazardous materials may change slightly under the F-35A aircraft beddown scenarios; however, the authorization process already in place for the acquisition of these materials would ensure that only the specific types and quantities necessary to carry out the mission would be brought to the Luke AFB installation.

The quantity of hazardous waste generated at the Luke AFB installation may decrease as the F-35A's composite body would require less painting. Currently, paint waste is one of the major waste streams at Luke AFB. At this time, it is anticipated that Luke AFB would remain a large-quantity generator pursuant to the Resource Conservation and Recovery Act. After the aircraft arrive and maintenance practices and waste streams stabilize, the base's generator

status may change. If any new hazardous waste generation or handling areas (e.g., Satellite Accumulation Points or Central Accumulation Points) are established as a result of the F-35A aircraft beddown scenarios, they would be managed in accordance with the Luke AFB AFI 32-7001, *Hazardous Waste Management* (Luke AFB 2007b).

Environmental Restoration Program. The proposed footprints for the construction and demolition projects associated with the F-35A aircraft scenarios are not known at this time. As these projects are sited and designed, coordination with the 56th Civil Engineer Squadron would occur to determine any potential for disturbance of past ERP sites. It is possible that undocumented contaminated soils from historical fuel spills may be present beneath portions of the base. Any potential impacts associated with unknown contamination would be mitigated through worker awareness and safety training.

Toxic Substances. Prior to any demolition associated with the F-35A aircraft beddown scenarios, surveys would be conducted to determine the presence of ACMs. If ACMs are present, Luke AFB would employ appropriately trained and licensed contractors to perform the ACM removal work and would notify the contractors of the presence of ACMs so that appropriate precautions could be taken to protect the health and safety of the workers. ACMs would be segregated for disposal and managed in accordance with applicable Federal, state, and local regulations.

Prior to any demolition associated with the F-35A aircraft beddown scenarios, surveys would be conducted to determine the presence of LBP. If LBP is present, Luke AFB would employ appropriately trained and licensed contractors to perform work involving the LBP and would notify the contractor of the presence of LBP so that appropriate precautions could be taken to protect the health and safety of the workers.

LU 4.0 Luke AFB Cumulative Effects and Irreversible and Irretrievable Commitment of Resources

Council on Environmental Quality regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person (Federal or non-Federal) undertakes such other actions" (40 CFR 1508.7). In this section, an effort has been made to identify past and present actions in the Luke AFB region and those reasonably foreseeable actions that are in the planning phase or unfolding at this time. Actions that have a potential to interact with the beddown of F-35A at Luke AFB are included in this cumulative analysis. This *Final F-35A Training Basing Environmental Impact Statement* has sought to incorporate all known past, present, and reasonably foreseeable projects that could interact with the basing of F-35A training aircraft in this cumulative analysis. Any active base and training airspace will continue to have proposed mission adjustments and any such adjustments will be evaluated for environmental consequences prior to any decisions regarding the action under consideration. This approach enables decisionmakers to have the most current information available so that they can evaluate the environmental consequences of the beddown of F-35A aircraft at Luke AFB, use of auxiliary airfields Aux-1 and Gila Bend AFAF, and training in associated airspace.

Luke AFB is an active military installation of the 56 FW of the U.S. Air Force's Air Education and Training Command (AETC). It is the largest active-duty F-16 training base in the world with over 160 assigned F-16 aircraft, composed of 25 squadrons. The 56 FW's primary mission is to train fighter pilots and crew chiefs for the Air Force. The 944 FW of AFRC is a major tenant at Luke AFB. The installation undergoes changes in mission and in training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the installation requires new construction, facility improvements, infrastructure upgrades, and other maintenance/repairs on a nearly continual basis. Although known construction and upgrades are a part of the analysis contained in this document, some future requirements cannot be predicted. As those requirements surface, future NEPA analysis will be conducted, as necessary.

LU 4.1 Past, Present, and Reasonably Foreseeable Actions

Luke AFB has been a training field for conventional fighters since its inception in 1941, using a wide range of aircraft, including the P-38, P-51 Mustang, F-84, F-104 Starfighter, F-100, F-4 Phantom, and F-15 Eagle. Luke AFB began training F-16 fighter pilots in 1983 and has continued to use this aircraft ever since. As a result of realignments in the early 1990s, F-15 training aircraft were transferred out. The 58th Test and Training Wing was designated as the 58 FW and became the host unit at Luke AFB. The 58 FW was replaced by the 56 FW (the current host unit) in 1994 as part of the Air Force Heritage Program. To comply with 2005 BRAC recommendations, Luke AFB redistributed about 27 F-16 aircraft to other locations. Intrinsic to the training mission is the use of the 1.05-million-acre BMGR East and associated restricted airspace, where pilots and aircrews practice their required skills in air-to-air maneuvering and simulated engagement of ground targets.

Table LU 4.1–1 summarizes past, present, and reasonably foreseeable actions within the region that could interact with the beddown of F-35A at Luke AFB. The table briefly describes each identified action, presents the proponent or jurisdiction of the action and the timeframe (e.g., past, present/ongoing, future), and indicates which resources potentially interact with the beddown of F-35A at Luke AFB. Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the region surrounding Luke AFB.

Table LU 4.1–1. Past, Present, and Reasonably Foreseeable Actions at Luke AFB and Associated Region

Action	*Proponent/ Location*	*Timeframe*	*Description*	*Resource Interaction*
Military Actions				
Environmental Assessment for Recapitalization of the 49th WG Combat Capabilities and Capacities, Holloman Air Force Base, New Mexico	Air Education and Training Command, Holloman AFB, Luke AFB	Present	Air Education and Training Command is implementing the relocation of the F-16 training mission from Luke AFB, Arizona, to Holloman AFB, New Mexico. The relocation of the F-16 training mission is expected to occur in FY2013.	Airspace Management and Use, Noise, Air Quality, Socioeconomics, Infrastructure, Transportation, Hazardous Materials and Waste.
United States Marine Corps Joint Strike Fighter F-35B West Coast Basing Environmental Impact Statement	U.S. Navy, USMC	Future	The USMC is considering the basing of the F-35B at MCAS Yuma, Arizona. If based on MCAS Yuma, the F-35B is proposed to use BMGR and other airspace units in the vicinity of Luke AFB and Tucson AGS.	Airspace Management and Use, Noise, Air Quality.
Environmental Impact Statement Proposed Range Enhancements at Barry M. Goldwater Range East	Air Education and Training Command, Luke AFB	Present, future	Ten different actions are proposed at BMGR East and Gila Bend AFAF to help ensure successful and efficient training for military units at BMGR East. Activities included in the proposed action: creation of new target areas, range reconfiguration, new training activities, and renovation/construction on Gila Bend AFAF.	Airspace Management and Use, Air Quality, Biological Resources, Land Use and Recreation, Noise, Soil Resources, Water Resources.
Environmental Assessment for Four Military Construction Projects, Luke Air Force Base, Maricopa County, Arizona	Air Education and Training Command, Luke AFB	Present, future	Construction projects for 56 FW including a new Communications Operations Center, a new Contracting Center, an addition to the Fitness Center, and repair of the airfield pavement of Runway 03R/21L, and the demolition of five buildings.	Infrastructure, Safety, Soil Resources, Water Resources.
Environmental Assessment for Base Realignment and Closure Actions, Luke AFB Arizona	Air Education and Training Command, Luke AFB	Past (actions completed in FY2009)	In accordance with 2005 BRAC Recommendations, Luke AFB redistributed 15 F-16 aircraft from the 944 FW and 22 F-16 Aircraft from the 56 FW, with a corresponding reduction in flight operations and personnel.	Represented in baseline conditions.

Action	*Proponent/ Location*	*Timeframe*	*Description*	*Resource Interaction*
Environmental Assessment for the Implementation of National Guard Bureau's Training Plant (TP) 60-1, Operation Snowbird	HQ ACC, Davis-Monthan AFB	Present, future	The EA evaluates the number of sorties and aircraft types conducted by Operation Snowbird. The No Action Alternative is the level of operations from the 2002 CSAR Beddown EA. The action alternatives include increasing the number of sorties and adding new aircraft types, including U.S. and foreign aircraft such as F-22s, F-18E/F, Tornadoes, Typhoon, and Kfir. Training operations would be conducted at Davis-Monthan AFB and Outlaw, Jackal, Reserve, Morenci, Tombstone, and Sells MOAs, as well as BMGR East. This EA is currently being developed.	Airspace Management and Use, Noise, Air Quality.
Proposed Transition to F-16 Block 32 at Tucson AGS, Arizona	Air National Guard, Tucson AGS	Present, future	The F-16 Block 25 aircraft currently assigned to Tucson AGS are coming to the end of their operational lifespan. The Air National Guard proposes to replace the Block 25 aircraft with Block 32 aircraft in a one-for-one exchange. The F-16 Block 32 aircraft would operate at Tucson AGS and in the airspace in the same manner as the F-16 Block 25 aircraft do currently.	Noise, Air Quality.
Non-Military Federal				
BLM Yuma Field Office RMP	BLM Yuma Field Office	Ongoing, future	Resource Management Plan for BLM-managed land in southwestern Arizona. Includes the designation of 3 Areas of Critical Environmental Concern and the allocation of 5 Wildlife Habitat Management Areas, 5 Special Recreation Management Areas, and 10 Special Cultural Resource Management Areas.	Biological Resources, Cultural Resources, Land Use and Recreation.
Agua Fria National Monument Record of Decision and Approved Resource Management Plan	BLM Hassayampa Field Office	Ongoing, future	Resource Management Plan for BLM-managed national monument in central Arizona.	Cultural Resources.
Bradshaw-Harquahala Record of Decision and Approved Resource Management Plan	BLM Hassayampa Field Office	Ongoing, future	Resource Management Plan for BLM-managed land in central Arizona. Actions include the designation of 4 new Areas of Critical Environmental Concern, 15 Special Recreation Management Areas and Recreation Management Zones, and 5 Special Cultural Resource Management Areas.	Biological Resources, Cultural Resources, Land Use and Recreation.
Environmental Impact Statement for the Restoration Design Energy Project and Possible Land Use Plan Amendment	BLM Arizona State Office	Future	Future project to support possible amendments to several BLM-Arizona Resource Management Plans to identify sites and/or areas managed by BLM that may be suitable for the development of renewable energy and to establish appropriate design criteria for such projects.	Land Use.

Action	*Proponent/ Location*	*Timeframe*	*Description*	*Resource Interaction*
Western Renewable Energy Zones-SunZia Transmission Study Corridor and EIS	Western Governors' Association and U.S. Department of Energy	Future (long range)	Establish about 500-mile, 500-kilovolt transmission line from central New Mexico to south–central Arizona. Towers up to 160 feet in height. Several alignments considered in wide study corridor.	None.
State and Local				
Town of Gila Bend General Plan (2006)	Town of Gila Bend	Present, future	The town plan identifies a goal to support the mission of Luke AFB and the role of Gila Bend AFAF and to promote development that is consistent with the recommendations of the Gila Bend AFAF/BMGR JLUS. Planned land use designations under the south of the Union Pacific rail line are primarily low-density residential (defined as 1 to 5 dwelling units per acre), with light industrial along the rail line.	Land Use.
Solar Array/Plant at Luke AFB	Luke AFB/Arizona Public Service Company	Future (Environmental Assessment in progress)	Installation of 15-megawatt-hour solar plant on a 100-acre area on Luke AFB.	Infrastructure.
Luke AFB Aux-1 and Gila Bend AFAF/BMGR JLUS (2005)	Arizona Department of Commerce	Present, future	Goal of JLUS is the facilitation of cooperation between local communities and Luke AFB/BMGR to implement effective land use regulations, including maintaining compatible land uses around affected areas and reducing potential encroachment. Describes regional and local land uses surrounding auxiliary airfields, projected changes, and compatibility planning issues. High growth trend in communities surrounding Aux-1, with rapid development and changes in land use anticipated.	Land Use and Recreation.

LU 4.2 Cumulative Impacts

The following analysis considers how the impacts of the actions in Table LU 4.1–1 might affect or be affected by the F-35A beddown scenarios at Luke AFB. The analysis considers whether such a relationship would result in potentially significant impacts not identified when the beddown of F-35A at Luke AFB is considered alone.

Luke AFB. Implementation of four proposed construction projects at Luke AFB in combination with projected construction under the Luke AFB F-35A scenarios, would slightly increase the total amount of construction occurring at the base over the next several years. Sound engineering and management practices would minimize cumulative impacts during and following construction. Additional impervious surface on the installation would require installation of appropriate storm water system improvements. A recent reduction of assigned F-16 aircraft and operations (and related noise) is reflected in the current baseline for the airfield and somewhat offsets the cumulative noise increases of the F-35A scenarios. Nonetheless, projected changes in noise levels are high.

Auxiliary Airfields. No major changes are expected in activities or land use around Gila Bend AFAF. The town of Gila Bend is experiencing modest growth. The recently adopted Town of Gila Bend General Plan (in 2006) commits to following state guidelines for compatible land use. It is likely that recommended noise attenuation would only apply in the future to new approvals, following the zones delineated in the 2005 JLUS. Noise levels for the F-35A would expand the areas exposed to 65 dB and greater, but this is not reflected in existing guidelines, unless they have been updated. This could result in approval of incompatible uses in the future and result in local encroachment on the Gila Bend AFAF.

Aux-1 is surrounded by rapidly growing communities. The combination of growth increases the potential for encroachment. Continuing coordination between Aux-1 and local communities on joint land use compatibility issues could limit the potential for future encroachment that could negatively impact operations at the airfield or quality of life in surrounding areas.

Training Airspace. Proposed training in R-2301E and the TAC training areas on BMGR may be higher than evaluated if both Tucson AGS and Luke AFB receive F-35A aircraft, if MCAS Yuma receives the F-35B aircraft, and if Operation Snowbird increases the number of operations. Combined units of F-35A aircraft from Tucson AGS and Luke AFB, and the proposed lowering of the floor of R-2301E over Cabeza Prieta NWR could cause increases in noise that are not compatible with conservation of wildlife. However, noise over this area is part of the existing context to which wildlife has adapted. Current proposals that would expand the capabilities of BMGR East, if approved, would likely increase use of restricted airspace over BMGR by various Air Force units at Luke AFB and transient users. In combination with operations associated with enhanced capabilities being developed on BMGR East and additional F-35A operations from Tucson AGS and possibly Luke AFB, as well as increased operations from Operation Snowbird, future operational levels could increase noise levels beyond those evaluated in this EIS. Since public use of BMGR is already restricted due to incompatibility with military uses, potential to impact public uses and recreation is relatively low. Effects on wildlife and cultural resources would be similar to those described in this EIS but potentially with a higher degree of impact. Capacity of restricted airspace at BMGR to support combined operations safely may

require further consideration. Higher levels of activity could add to the workload of BMGR command, control, and advisory services and could generate a need for additional airspace management personnel.

The proposed transition of Tucson AGS from the F-16 Block 25 to the F-16 Block 32 is not anticipated to create cumulative impacts with the proposed F-35A beddown. The transition would include a one-for-one exchange between the Block 25 and Block 32 aircraft so no additional sortie-operations would be conducted within the training airspace. Additionally, the Block 25 and Block 32 use the same engine; therefore, noise parameters and air emissions between the two block types would be the same.

The F-35B aircraft proposed for MCAS Yuma would use BMGR as one of the primary training ranges. BMGR West is scheduled by the USMC, while BMGR East is scheduled by the Air Force. However, the F-35B is proposed to replace legacy aircraft, and the net change in training operations in BMGR East would decrease compared with baseline levels. Continued coordination between MCAS Yuma and the Air Force users would be necessary to schedule use of BMGR East amongst the various users of the range. As the primary user and scheduling agency, the Air Force would have priority for use of BMGR East.

In general, the resource management actions by the various Federal land managers and tribal entities in the lands underlying training airspace are implemented on the ground and would not overlap with the use of regional airspace. However, some projects could interact and require local coordination, such as controlled burning, which can cause localized smoke that could be hazardous to high-speed military flying operations. The planning and siting of future tall structures, such as transmission lines, wind farms, and communication towers, pose compatibility concerns for low-altitude flight operations, particularly in MTRs. Several ongoing and proposed Resource Management Plans could approve new SULMAs with conservation and recreational values. Noise impacts on these areas may be inconsistent with conservation-oriented management goals. Nonetheless, impacts would be similar to those described in the EIS resource sections (such as Land Use and Recreation, Wildlife, and Cultural Resources). A military airspace regional coordinator could serve as a representative to assist with mutually compatible long-term sustainable solutions between responsible Federal agencies.

LU 4.3 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For the beddown of F-35A aircraft at Luke AFB, most resource commitments are neither irreversible nor irretrievable. Most impacts are short term and temporary, such as air emissions from construction, or longer lasting but negligible, such as public service increases. Increases in sonic booms would not be negligible. However, the duration of individual booms would be

extremely brief. Those limited resources that may involve a possible irreversible or irretrievable commitment are discussed below.

If Luke AFB is the chosen beddown location, some land on the east side of the airfield would be disturbed. Much of this land has been previously disturbed and is heavily influenced by airfield development. Construction and renovation of base facilities would require the consumption of limited amounts of material typically associated with interior renovations (wiring, insulation, windows, drywall) and exterior construction (concrete, steel, sand, brick). An undetermined amount of energy to conduct renovation, construction, and operation of these facilities would be expended and irreversibly lost.

Training operations would continue and would involve consumption of nonrenewable resources, such as gasoline used in vehicles and jet fuel used in aircraft. Use of training ordnance would involve commitment of chaff and flares. None of these activities are expected to significantly decrease the availability of minerals or petroleum resources. Personal vehicle use by the personnel continuing to support the existing missions would consume fuel, oil, and lubricants. The amount of these materials used would increase slightly; however, this additional use is not expected to significantly affect the availability of the resources.

Alternative

Tucson AGS

You are in the Tucson AGS section.

This page is intended to help you find specific information about Tucson AGS and to clarify this section's relation to the rest of the EIS.

Overall Proposal

Table of Contents, List of Figures, List of Tables, and Acronyms and Abbreviations

Preface: Detailed Guide for Reading the EIS → Go back to the Preface for a detailed guide for reading the EIS.

Chapter 1: Purpose and Need for F-35A Training Basing → Go back to Chapter 1 for an explanation of the decision made by Congress to provide the U.S. Air Force with a next-generation fighter. Also described are the features of the F-35A, how the F-35A will be based, and how aircrews will train for their operational assignments.

Chapter 2:
- Overview of Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of Proposed Action and Alternatives

→ Go back to Chapter 2 for an overview of the Proposed Action and alternatives, which is to beddown the F-35A at Boise AGS, Holloman AFB, Luke AFB, and/or Tucson AGS.

Chapter 3: Resource Definition and Methodology for Analysis → Go back to Chapter 3 for a definition of the environmental resources that could potentially be affected by the Proposed Action and an explanation of the methodology used to evaluate the potential impacts.

Chapter 4: Base-Specific Sections → Base-specific sections are listed below.

Base-Specific Information

BO-Boise AGS Alternative — See Boise AGS Section

HO-Holloman AFB Alternative — See Holloman AFB Section

LU-Luke AFB Alternative — See Luke AFB Section

TU-Tucson AGS Alternative

Section TU 1.0
Introduction

Section TU 2.0
Detailed Description of Action

Section TU 3.0
Affected Environment and Environmental Consequences

Aircraft Operations
TU 3.1 Airspace Management and Use
TU 3.2 Noise
TU 3.3 Air Quality
TU 3.4 Safety

Natural Resources
TU 3.5 Soils and Water
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TU 3.8 Threatened, Endangered, and Special Status Species

Cultural and Traditional Resources
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TU 3.10 Land Use and Recreation
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TU 3.12 Environmental Justice and Protection of Children

Community and Infrastructure
TU 3.13 Infrastructure
TU 3.14 Transportation
TU 3.15 Hazardous Materials and Waste

Section TU 4.0
Cumulative Effects and Irreversible and Irretrievable Commitment of Resources

This section of the EIS presents site-specific and resource-specific details on the existing environmental conditions of Tucson AGS. It also describes the potential environmental consequences of the proposed beddown of the F-35As at the base.

A summary of public and agency comments received during scoping is included in Section TU 2.2.3.

Comments received during the public review period of the Draft EIS, as well as Air Force responses, are included in Appendix D.

Overall Proposal

References	List of Preparers	Index	List of Repositories	Glossary	Appendices A, B, and C
Volume 1	Volume 1	Volume 1	Volume 1	Volume 1	Volume 2

DEIS Comments

Appendix D, D.1, D.2, and D.3	Appendix D, D.4 and D.5	Appendix D, D.6, D.7, D.8, and D.9	Appendix D, D.10
Receipt and Locating Comments	Alphabetical Directory	Copies of Letters and Transcripts	Response to Comments
Volume 2	Volume 2	Volume 2	Volume 2

TU 1.0 Tucson AGS Overview

This section of Chapter 4 presents the operational and environmental factors specific to Tucson International Airport Air Guard Station (Tucson AGS). Section TU 2.0 explains that three scenarios are being considered for Tucson AGS, ranging from a beddown of 24 Primary Aircraft Authorized (PAA), (Scenario T2), 48 PAA (Scenario T2), or 72 PAA (Scenario T3), and describes the specific actions at Tucson AGS that would be required for the beddown under each scenario.

The environmental resources at Tucson AGS, as well as under its airspace, would be affected by the basing of an F-35A Pilot Training Center (PTC). These resources and the potential consequences are discussed in Section TU 3.0. Section TU 4.0 describes the cumulative actions and consequences and the irreversible and irretrievable commitment of resources that would be associated with a basing decision at Tucson AGS. Figure TU 1.0–1 shows the location of Tucson AGS and surrounding communities.

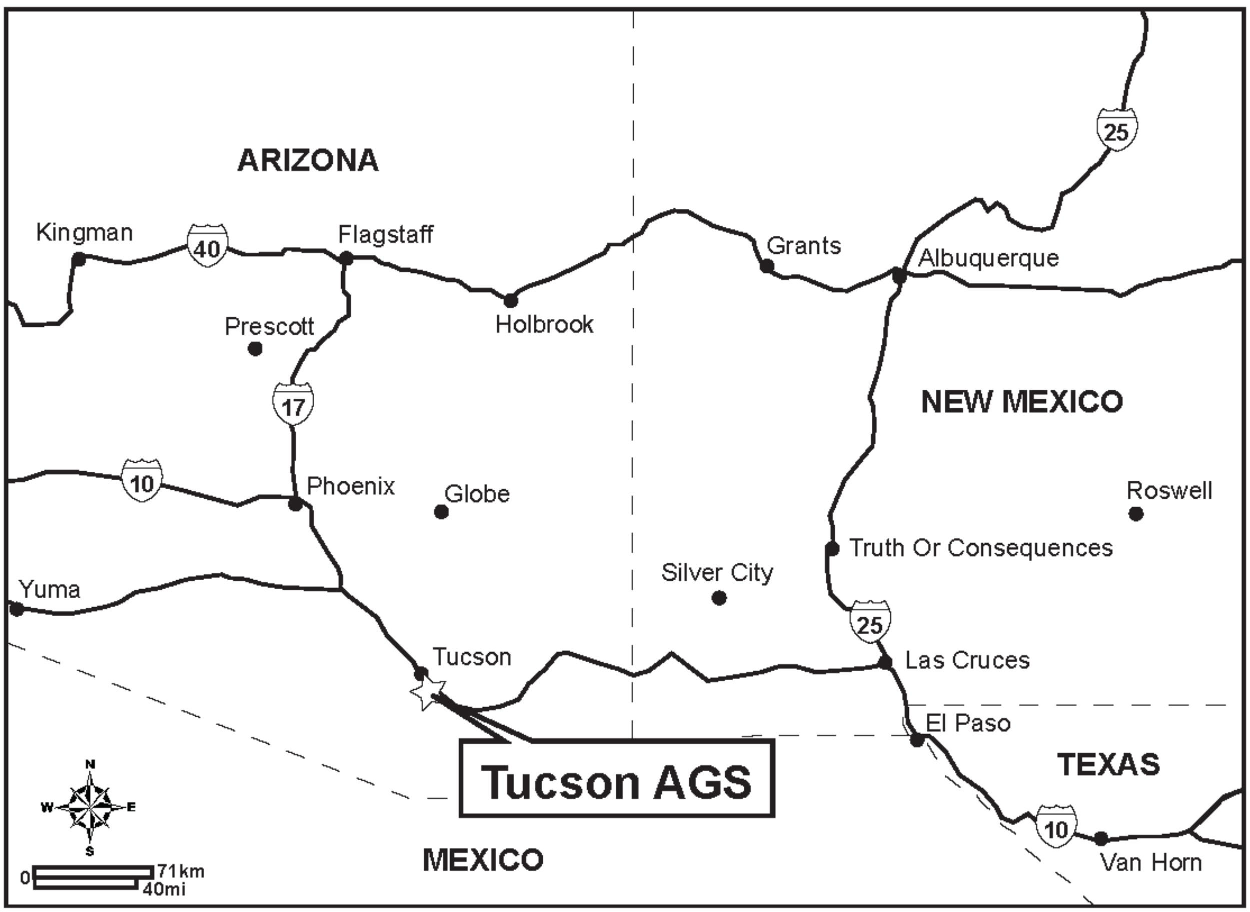


Figure TU 1.0–1. Vicinity of Tucson AGS, Arizona

TU 2.0 Tucson AGS Alternative (Scenarios T1, T2, and T3)

This section details the actions that would occur at Tucson AGS, Arizona, and in the associated training airspace if Tucson AGS were selected for the basing of an F-35A PTC.

Tucson AGS was evaluated by the U.S. Air Force (Air Force) for the potential to beddown up to 144 F-35A PAA. However, the Air Force determined Tucson AGS's infrastructure and base resources would accommodate between 24 F-35A PAA and 72 F-35A PAA within the constraints set by the Air Force's alternative narrowing process described in Section 2.2.2. This Environmental Impact Statement (EIS) includes three F-35A beddown scenarios: Scenario T1 (24 aircraft), Scenario T2 (48 aircraft), and Scenario T3 (72 aircraft), as shown in Table TU 2.0–1. For planning purposes in this EIS, the Air Force F-16 training mission currently located at Tucson AGS is assumed to relocate under all three scenarios. However, the Dutch F-16 training mission and the Air National Guard (ANG)/Air Force Reserve Command Test Center (AATC) would remain under Scenario T1. Under Scenarios T2 and T3, it is assumed that the ANG/AATC would remain in place at Tucson AGS and would continue to operate 6 F-16 PAA, but the Dutch F-16 training mission would relocate to another installation. As described in Chapter 2, Section 2.5, the No Action Alternative for Tucson AGS constitutes the baseline conditions.

Table TU 2.0–1. Tucson AGS F-35A Aircraft Scenarios

Aircraft Scenario	*F-16 PAA*	*F-35A PAA*	*Total PAA at Tucson AGS*
Baseline Conditions[1]	65	0	65
Scenario T1 (24 Aircraft)	18	24	42
Scenario T2 (48 Aircraft)	6	48	54
Scenario T3 (72 Aircraft)	6	72	78

[1] Includes the Air National Guard F-16 Training Mission, the Air National Guard (ANG)/Air Force Reserve Command Test Center (AATC) F-16 aircraft, and the Netherlands F-16 Training Mission.

TU 2.1 Tucson AGS: Base

Three elements of this alternative have the potential to affect Tucson AGS and its immediate vicinity. These elements are (1) airfield operations, (2) construction/renovation of facilities, and (3) personnel changes. Each is described in detail below. This EIS evaluates the environmental consequences of the beddown of F-35A aircraft under each aircraft scenario.

TU 2.1.1 Airfield Operations

> ***Airfield operations*** are categorized as takeoffs, landings, closed patterns (including activities referred to as "touch-and-go operations," "go-arounds," or "low approaches"), or inter-facility transfers.

Table TU 2.1–1 provides the number of annual airfield operations anticipated with the basing of the F-35A training mission at Tucson AGS by each aircraft scenario. Tucson AGS is home to the 162nd Fighter Wing (162 FW), which includes two squadrons of F-16 aircraft with a total of 47 PAA. The 162 FW also hosts a squadron of 12 F-16AM PAA from the Netherlands. The AATC, with 6 F-16 PAA, is a tenant unit on Tucson AGS. Under Scenario T1, the two ANG F-16 squadrons would depart Tucson AGS, while the Dutch F-16 training unit (12 PAA F-16AM) and the 6 F-16 PAA

assigned to the AATC would remain with 24 F-35A aircraft. Under Scenarios T2 and T3, the two ANG F-16 squadrons and the Dutch F-16 training unit would depart Tucson AGS, but the 6 F-16 PAA assigned to the AATC would remain in place and continue to operate. Under Scenario T1, F-35A aircraft would conduct 12,493 aircraft operations annually at Tucson AGS. Unrelated to the F-35A beddown, the Federal Aviation Administration (FAA) Terminal Area Forecast predicts non-military aircraft operations on the runways to increase by approximately 2 percent annually in coming years.

Table TU 2.1–1. Tucson AGS Baseline and Projected Annual Airfield Operations

	Baseline Annual Airfield Operations[1]	*Projected Annual F-35A Airfield Operations*		
		Scenario T1 (24 Aircraft)	**Scenario T2 (48 Aircraft)**	**Scenario T3 (72 Aircraft)**
F-35A	0	12,493	24,986	37,480
F-16	26,280	12,533	3,539	3,539
Other Military[2]	2,189	2,189	2,189	2,189
Tucson AGS Total	28,469	27,215	30,714	43,208
Tucson International Airport	170,820	199,990	199,990	199,990
Total	**199,289**	**227,205**	**230,704**	**243,198**

[1] Tucson Airport 2009.
[2] Other military includes transients such as A-10 and C-130.

Under Scenario T1, the beddown of 24 PAA F-35A aircraft in conjunction with relocation of the two ANG squadrons would result in a 4 percent reduction in total operations at Tucson AGS relative to the number of operations that would occur if no F-35A beddown were to take place. Under Scenarios T2 and T3, approximately 24,986 and 37,480 F-35A aircraft operations would be conducted at Tucson AGS, respectively. The total number of airfield operations at Boise AGS would increase by 8 percent and 52 percent relative to baseline conditions. Total annual aircraft operations at Tucson International Airport (TUS), including civilian aircraft, would increase by 14 percent, 16 percent, and 22 percent under Scenarios T1, T2, and T3.

The percentage of F-35A departures expected to use afterburner has been adjusted from the generalized percentage shown in Chapter 2, Table 2–6, based on local flying conditions such as airfield elevation and runway length. At Tucson AGS, 4 training events in the F-35A training syllabus have the potential for the use of afterburners during takeoff. As the training syllabus consists of 58 total training events, approximately 7 percent of the sorties would use afterburner to fulfill the training syllabus.

Of the 58 training events in the F-35A training syllabus, 10 have the potential for after-dark flights, constituting approximately 17 percent of the sorties under each aircraft scenario proposed to be conducted after sunset. However, aircraft operations during "environmental night" (10:00 p.m. to 7:00 a.m.) would be rare.

The F-35A would employ similar departure, closed patterns, and landing procedures as currently used by Tucson AGS aircraft. F-35A operations would adhere to existing restrictions, avoidance procedures, and agreements with the Tucson Airport Authority (TAA).

TU 2.1.2 Construction

Additional facilities and infrastructure would be required at Tucson AGS to support F-35A training operations. Table TU 2.1–2 lists the F-35A-related construction, demolition, and renovation projects required for each aircraft scenario. Construction, demolition, and renovation of facilities would take place within the 94 acres of previously disturbed area of the military installation included in the current lease agreement between the TAA and the U.S. Government (see Figure TU 2.1–1). Per the lease agreement, the U.S. Department of Defense (DoD) maintains the airfield pavements within the leasehold, while the TAA maintains the rest of the airfield, including the runways, parallel and connecting taxiways, taxilanes, and aircraft parking.

The total disturbed area presented in Table TU 2.1–2 comprises the total area covered by the construction footprints of the proposed facilities, plus the surrounding lands where construction-related clearing and grading would occur. Construction activities are expected to begin in fiscal year (FY) 2012 and be complete by FY2014, when the first F-35A is expected to be bedded down. Some of the pavements and airfield surfaces may need to be upgraded. For the F-35A, any asphalt taxiways, parking aprons, or holding spots would need to be replaced with concrete.

Renovations would be required for the existing facilities and facilities vacated by the departing F-16 squadrons to meet the security and space requirements for the F-35A. The beddown of 48 or 72 aircraft would require additional construction for squadron operations, maintenance, and hangars. Construction of new academic training facilities, including simulators, additional hangar bays, and corrosion control bays, and squadron operations would be required. The existing Munitions Support Area would be relocated to provide additional space for construction requirements and to improve land use compatibility.

Table TU 2.1–2. F-35A Construction at Tucson AGS Under Each Aircraft Scenario

Project	*No. of Aircraft*[1]	*Renovate*	*New/ Addition*	*Total Disturbed Area (square feet)*[2]
Taxiway	24	X		1,122,000
Parking Apron	24	X		57,200
Academic Training Center (3 Sq)	24		X	92,400
Operational Training Facility (FTD Classrooms)	24		X	13,662
Hangar upgrades	24		X	28,798
Battery Maintenance	24		X	880
Ejection Seat Maintenance	24		X	3,410
Flightline Maintenance Facility	24		X	2,970
Engine Maintenance	24		X	880
Corrosion Control (2 bay)	24		X	13,200
Gun System Maintenance	24		X	3,300
Support (AGE) Maintenance Facility	24		X	12,100
Bulk Fuel Storage	24		X	25,300
ComSec Space	24		X	1,540
Electrical Infrastructure	24		X	1 each
AGE Storage Area	24		X	9,900
Apron re-stripe	24	X		N/A
Interim Simulator Facility	24	X		17,600
Aircraft Maintenance Unit (AMU)	48	X	X	16,500
Maintenance Hangars (2 bay)	72		X	13,200
Squadron Operations (3 Sq)	24, 48, 72	X	X	31,900
Interim moves and relocations	24, 48, 72	X	X	N/A
Total for Scenario T1 (24 Aircraft)				**1,437,040**
Total for Scenario T2 (48 Aircraft)				**1,453,540**
Total for Scenario T3 (72 Aircraft)				**1,466,740**

[1] Construction for aircraft scenarios is additive, i.e., construction required for 72 aircraft includes all proposed construction under 24, 48, and 72 aircraft.

[2] Total disturbed area is estimated to be 10 percent larger than the footprint of the finished facility as a best engineering estimate to account for disturbance by construction activities, including laydown areas and utility connections.

Key: AGE=aerospace ground equipment; FTD=Field Training Detachment; N/A=not applicable.

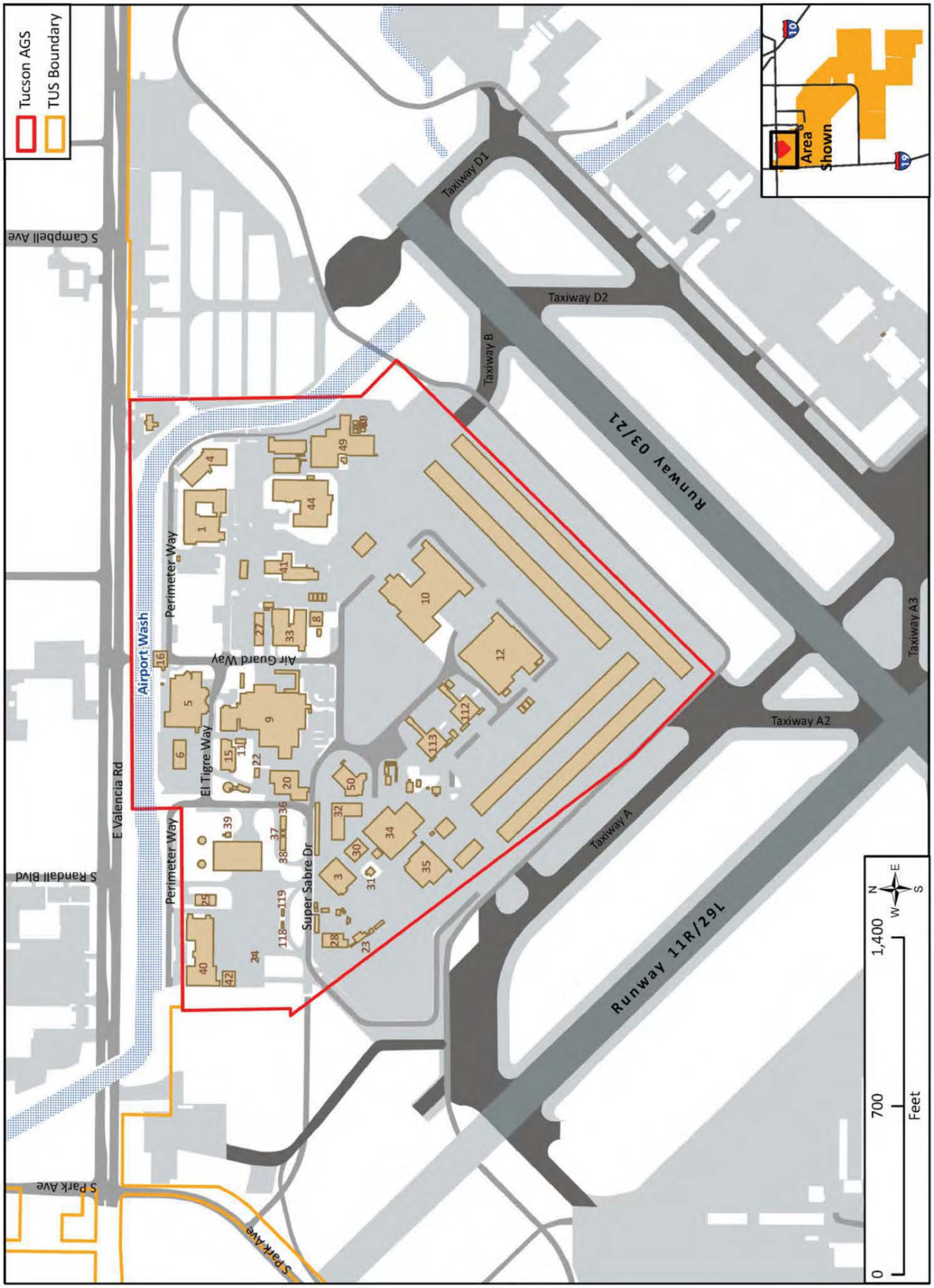


Figure TU 2.1–1. Tucson AGS F-35A Construction Area

TU 2.1.3 Personnel Changes

Beddown of the F-35A training mission would also require basing and appropriately skilled personnel sufficient to operate and maintain the wing and provide necessary support services (see Table TU 2.1–3). Each aircraft scenario has a different manpower requirement. The manpower associated with the F-16 would depart or be re-trained as F-35A manpower, depending on the skill sets of the individuals stationed at Tucson AGS.

Table TU 2.1–3. Tucson AGS F-35A Training Mission Personnel Changes

F-35A Scenario (No. of Aircraft)	*F-16 Mission Personnel*[1]	*Other Base Personnel*	*F-35A Personnel*	*F-35A Contractors*	*F-35A Students*[2]	*Total Base Personnel*	*Net Change in Personnel*	*Depen-dents*[3]	*Total Base Population*	*Net Change*
Baseline Conditions	904	1,042	–	–	–	1,946	N/A	4,281	6,227	N/A
Scenario T1 (24)	–	1,042	691	50	30	1,813	(133)	3,922	5,734	(493)
Scenario T2 (48)	–	1,042	994	50	60	2,146	200	4,590	6,736	509
Scenario T3 (72)	–	1,042	1,115	50	90	2,297	351	4,856	7,153	926

[1] F-16 mission personnel only.
[2] The Air Force assumes the F-35A students would be unaccompanied by dependents.
[3] The Air Force assumes 2.2 dependents per military member.
Note: (Number) denotes a negative number.
Key: BOS=Base operating support.

TU 2.2 Tucson AGS: Airspace and Ranges

As a replacement and supplement to the F-16 aircraft at Tucson AGS and the A-10 aircraft at Davis-Monthan Air Force Base (AFB), the F-35A would conduct missions and training programs similar to both aircraft (see Chapter 2). This would include air-to-air and air-to-ground training. The Air Force expects that the F-35A would operate in the airspace associated with Tucson AGS in a manner similar to the F-16 squadrons from Tucson AGS and Luke AFB, as well as the A-10s from Davis-Monthan AFB, which currently use that airspace. All F-35A flight training activities would take place in existing airspace; therefore, no airspace modifications would be required.

TU 2.2.1 Airspace and Auxiliary Airfield Use

Airspace

Figure TU 2.2–1 shows the Special Use Airspace (SUA) and Airspace for Special Use (ASU) the F-35A would use for flight training. Tables TU 2.2–1 and TU 2.2–2 list annual sortie-operations counts under baseline conditions and projected annual sortie-operations under Scenarios T1 through T3. F-35A aircraft would use other SUA units on an occasional basis, typically when primary airspace units are not available due to inclement weather or scheduling conflicts. Each of the Military Operations Areas (MOAs) listed have overlying Air Traffic Control Assigned Airspace (ATCAAs) that provide the higher altitudes needed for flight maneuvers above the MOA ceilings. The Ruby, Outlaw, Tombstone, and Jackal MOAs/ATCAAs and the Rustler Airspace are scheduled and managed by the 162 FW at Tucson AGS (see Table TU 2.2–1). The Sells MOA/ATCAA and Restricted Area 2301E (R-2301E) are scheduled and managed by the 56th Fighter Wing (56 FW) at Luke AFB.

> A ***sortie-operation*** is the use of one airspace unit by one aircraft.

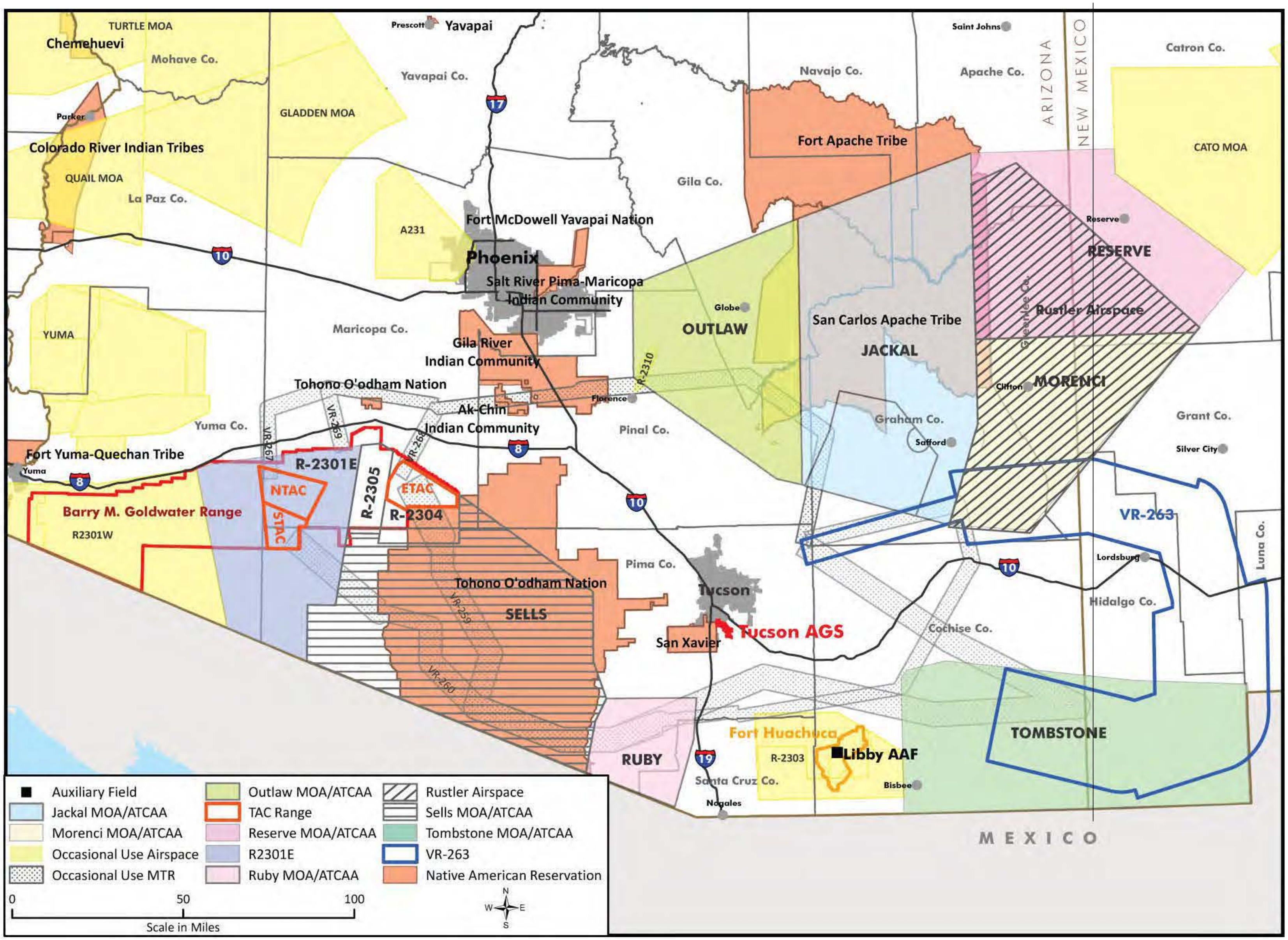


Figure TU 2.2–1. Airspace and Ranges for the F-35A Beddown at Tucson AGS, Arizona

Table TU 2.2–1. Projected F-35A Airspace Use at Tucson AGS

Special Use Airspace	*Supersonic Authorized?*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	*Projected Annual F-35A Sortie-Operations*		
				Scenario T1 (24 Aircraft)	**Scenario T2 (48 Aircraft)**	**Scenario T3 (72 Aircraft)**
MOAs/ATCAAs						
Ruby MOA/ATCAA	No	F-35A	0	979	1,959	2,938
		F-16	1,668	377	242	242
		F-15	15	15	15	15
		A-10	304	304	304	304
		F-18	128	128	128	128
		Total	**2,115**	**1,803**	**2,648**	**3,627**
Outlaw MOA/ATCAA	No	F-35A	0	627	1,255	1,882
		F-16	1,283	290	186	186
		F-15	12	12	12	12
		A-10	234	234	234	234
		F-18	98	98	98	98
		Total	**1,627**	**1,261**	**1,785**	**2,412**
Jackal MOA/ATCAA	No	F-35A	0	1,447	2,894	4,341
		F-16	1,675	379	243	243
		F-15	16	16	16	16
		A-10	306	306	306	306
		F-18	128	128	128	128
		Total	**2,125**	**2,276**	**3,587**	**5,034**
Sells MOA/ATCAA	Yes, above 10,000 feet MSL	F-35A	0	1,033	2,076	3,100
		F-16	8,321	1,883	1,205	1,205
		F-15	145	145	145	145
		A-10	2,031	2,031	2,031	2,031
		F-18	871	871	871	871
		Total	**11,368**	**5,963**	**6,328**	**7,352**
Rustler Airspace	No	F-35A	0	685	1369	2054
		F-16	1939	439	281	281
		F-15	18	18	18	18
		A-10	354	354	354	354
		F-18	149	149	149	149
		Total	**2,460**	**1,645**	**2,171**	**2,856**
Tombstone MOA/ATCAA	No	F-35A	0	281	562	843
		F-16	2,685	608	389	389
		F-15	25	25	25	25
		A-10	490	490	490	490
		F-18	206	206	206	206
		Total	**3,406**	**1,610**	**1,672**	**1,953**
Restricted Areas						
R-2301E BMGR-East North TAC/South TAC Range Airspace	Yes, above 5,000 feet AGL	F-35A	0	507	1,013	1,520
		F-16	16,342	3,697	2,366	2,366
		F-15	169	169	169	169
		A-10	3,322	3,322	3,322	3,322
		F-18	1,397	1,397	1,397	1,397
		Total	**21,230**	**9,092**	**8,267**	**8,774**

Key: AGL=above ground level; BMGR=Barry M. Goldwater Range; MSL=mean sea level; TAC=Tactical.

The ATCAA airspace units overlying MOAs are scheduled and managed by the Albuquerque Air Route Traffic Control Center (ARTCC). Cooperative scheduling of this airspace by the 162 FW, 56 FW, and the Albuquerque ARTCC has ensured the needs of all airspace users are accommodated. In addition to the F-16s based at Tucson AGS, primary daily users of these airspace units include the F-16s located at Luke AFB; Snowbird Operations, which hosts various units and aircraft based out of Davis-Monthan AFB; and A-10s, C-130s, and HH-60s from Davis-Monthan AFB. Casual daily users (i.e., users not given first priority during scheduling) are F-15s, AV-8s, and F-18s out of Marine Corps Air Station (MCAS) Yuma and MCAS Miramar. Transient users include B-52s, B-1s, C-130s, AV-8s, KC-135s, KC-10s, and EA-6Bs. In addition to MOAs, ATCAAs, and Restricted Areas, low-level Military Training Routes (MTRs) would be used in F-35A training events. Table TU 2.2–2 lists the MTRs to be used by the F-35A.

Table TU 2.2–2. Projected F-35A MTR Use at Tucson AGS

MTR	*Min/Max Altitudes*	*Min/Max Width*	*Aircraft Type*	*Baseline Annual Sortie-Operations*	*Projected Annual F-35A Sortie-Operations*		
					Scenario T1 (24 Aircraft)	**Scenario T2 (48 Aircraft)**	**Scenario T3 (72 Aircraft)**
VR-263	100–3,000 feet AGL	2–15 NM either side of centerline	F-35A	0	84	169	253
			Other Military Aircraft	299	53	34	34
			Total	**299**	**137**	**203**	**287**

Note: F-35A training flights are limited to a minimum altitude of 500 feet above ground level.

The F-35A would operate at higher altitudes more often than legacy aircraft due to its advanced sensors and targeting capabilities. Approximately 85 percent of the training events in the F-35A training syllabus would be conducted at altitudes above 10,000 feet above ground level (AGL) (see Table TU 2.2–3).

Table TU 2.2–3. Representative A-10, F-16, and F-35A Altitude Use

Altitude (feet)	*Percentage of Flight Hours*		
	A-10	**F-16**	**F-35A**
> 30,000 MSL	0	1	6
18,000–30,000 MSL	0	3	34
10,000 AGL–18,000 MSL	4	40	45
5,000–10,000 AGL	33	26	8
2,000–5,000 AGL	26	13	4
500–2,000 AGL	30	14	3
100–500 AGL	7	3	0

Several training events in the F-35A syllabus could potentially use supersonic speeds. Supersonic operations would be conducted in authorized airspace and would be dictated by the altitudes authorized for each individual airspace unit. In the airspace listed in Table TU 2.2–1, supersonic operations are authorized in the Sells MOA/ATCAA at or above 10,000 feet mean sea level (MSL) and in R-2301E at 5,000 feet AGL or above.

Auxiliary Airfield

Libby AAF. Libby Army Airfield (Libby AAF) is identified as the auxiliary airfield for Tucson AGS F-35A aircraft. Libby AAF is located on Fort Huachuca near Sierra Vista, Arizona, in Cochise County. The airfield is currently a joint use facility sharing the airfield with the City of Sierra Vista for the Sierra Vista Municipal Airport. No commercial service is provided by the Sierra Vista Municipal Airport; however, it does support general aviation and provides ground services such as hangars for rent and fuel services. Libby AAF has three runways. The longest runway is 12,000 feet long, and the two remaining runways are 5,366 feet long and 4,285 feet long. The Army is the primary military user of Libby AAF. The Army has C-12 and RC-12 fixed-wing aircraft based at the airfield, as well as EH-60 and UH-1 rotary-wing aircraft. The airfield operations from the Tucson AGS F-35A training mission are compared with the baseline conditions at Libby AAF. Table TU 2.2–4 shows the number of airfield operations projected at Libby AAF under each aircraft scenario.

Table TU 2.2–4. Baseline and Projected Annual Auxiliary Airfield Operations at Libby AAF

Aircraft Type	*Baseline Annual Airfield Operations*	*Projected Annual F-35A Airfield Operations*		
		Scenario T1 (24 Aircraft)	**Scenario T2 (48 Aircraft)**	**Scenario T3 (72 Aircraft)**
F-35A	0	11,143	22,285	33,427
F-16	14,239	5,177	1,296	1,296
Other Military and Civilian Aircraft	56,256	56,256	56,256	56,256
Total	**70,495**	**72,576**	**79,837**	**90,979**

TU 2.2.2 Ranges, Ordnance, and Defensive Countermeasures

The F-35A is designed primarily as an air-to-ground weapons system. With the advances in technology, specifically targeting systems and guided munitions, the F-35A would only utilize guided ordnance, as listed in Chapter 2, Table 2–10. The guided munitions allow the F-35A to deploy munitions from a higher altitude and from longer distances than the unguided munitions often used by the A-10 or F-16. In addition to guided munitions, the F-35A is equipped with a 25-millimeter cannon. Chapter 2, Table 2–10, lists the type and number of munitions to be used 24 F-35A aircraft while fulfilling the syllabus requirements for the training mission. Table TU 2.2–5 lists the same munitions prorated by the number of F-35A aircraft under each scenario at Tucson AGS. As a training mission, live weapon drops would be infrequent, with only one training event per syllabus requiring live weapons. Up to 108 live weapons under Scenario T3 would be expected per year, which would be in place of the comparable F-16 live weapons loading currently conducted at Davis-Monthan AFB. These live weapons would be loaded onto the F-35A training aircraft at Davis-Monthan AFB prior to transiting to the Barry M. Goldwater Range (BMGR) for the weapons drop on an approved range. The F-35A would also train with Mobile Jettison Unit (MJU) 68/B, and MJU-69/B flares, which are described in detail in Chapter 2, Section 2.4.5.

The primary air-to-ground range available to Tucson AGS is the BMGR. BMGR is divided into BMGR West, which is under the jurisdiction of the Secretary of the Navy (MCAS Yuma) and BMGR East, which is under the jurisdiction of the Secretary of the Air Force (Luke AFB). These divisions reflect the typical pattern of military use, as most of the U.S. Marine Corps (USMC)

and U.S. Navy range operations are conducted on BMGR West, and the Air Force range operations are typically conducted on BMGR East. However, with prior approval and coordination, all Services can utilize either area of the range.

Table TU 2.2–5. Projected F-35A Annual Munitions Use

Munitions Type	*Projected Annual F-35A Usage*			*Range Permitted*
	Scenario T1 (24 Aircraft)	**Scenario T2 (48 Aircraft)**	**Scenario T3 (72 Aircraft)**	
GBU-12 (live)	36	72	108	BMGR
GBU-12 (inert)	78	156	234	BMGR
GBU-31 (inert)	20	40	60	BMGR
GBU-32 (inert)	26	52	78	BMGR
25-millimeter Target Practice (TP)	52,000	104,000	156,000	BMGR
MJU-61/B Training Flare	26,400	52,800	79,200	Authorized Airspace

Key: GBU=Guided Bomb Unit.

BMGR East is approximately 1.05 million acres of withdrawn public land and DoD-owned land. The primary mission of BMGR East is to support the training of Air Force, Air National Guard, Air Force Reserve Command, and Army Reserve National Guard units. Primary users of BMGR East include the F-16s from 56 FW and Tucson AGS, A-10s from Davis-Monthan AFB, and various users participating in Operation Snowbird out of Davis-Monthan AFB. There are eight aircraft weapons ranges in BMGR East. The eight aircraft weapons ranges allow a variety of munitions to be used such as air-to-air gunnery, rockets, missiles, and laser and a range of air-to-ground weapons, including live weapons up to 2,000 pounds. There are four manned ranges that permit only inert weapons. The remaining ranges permit both inert and live munitions. Each range is governed by individual restrictions and procedures dictating weapons types, aircraft headings, and times of use. BMGR East also utilizes electronic instrument sites to track and score military aircraft and range operations as well as simulate ground-to-air threats for training aircraft. There are 10 electronic transmitters stationed in the area below the restricted airspace, including sites within the BMGR East boundaries and Cabeza Prieta National Wildlife Refuge (NWR), and on U.S. Bureau of Land Management (BLM) and private land east of the Tohono O'odham Nation. Since BMGR East is proposed as the primary range complex for the F-35A mission at Tucson AGS, operations in BMGR West would be infrequent. Therefore, any reference to BMGR in this EIS is referring to BMGR East only unless otherwise specified.

The F-35A would also train with MJU-61/B training flares, which are described in detail in Chapter 2, Section 2.4.5. The MJU-61/B training flare is similar to the M-206 and MJU-7/B flares currently used by F-16 aircraft. The F-35A flares would be released in the same airspace authorized for flare use by the F-16. These airspace units include R-2301E, which overlies BMGR. The minimum release altitudes for flares in R-2301E for the portion of the airspace over government-owned or government-controlled land is determined by the fire danger and the type of flare and ranges between 300 feet AGL and 1,000 feet AGL. For the portion of R-2301E over Cabeza Prieta NWR, the minimum release altitude for flares is 1,500 feet AGL. Flares are also authorized for use in the Sells MOA, Outlaw MOA, Jackal MOA, Tombstone MOA, Ruby MOA, and the Rustler Airspace. The minimum release altitude for the Sells MOA is 3,000 feet AGL; for the Tombstone MOA, 5,000 feet AGL. The other airspace units have a minimum release altitude for flares of 2,000 feet AGL or the floor of the airspace unit, whichever is higher.

TU 2.2.3 Public Hearings and Agency Concerns

The Air Force conducted public hearings on the Draft EIS in communities in the immediate vicinity of Tucson AGS, as well as in the vicinity of potential airspace and auxiliary airfields. Hearings were held during the week of February 21, 2012, and the public comment period extended through March 14, 2012. There were a total of 311 attendees who signed in at the public hearings. During the public hearings, people were given the opportunity to provide oral and/or written comments on the F-35A Training Basing Draft EIS. Some of the comments and questions are summarized below in Table TU 2.2–6, along with the location in the EIS where the comment is addressed.

Table TU 2.2–6. Issues and Questions Identified During Draft EIS Public Review

Issues and Questions	Section in EIS or Comment Response Where Issue Is Addressed			
	Boise AGS	Holloman AFB	Luke AFB	Tucson AGS
Do we need the F-35A?	1.1; 1.3	1.1; 1.3	1.1; 1.3	1.1; 1.3
How does the F-35A noise compare with that of other military aircraft?	3.2; BO 3.2.1	3.2; HO 3.2.1	3.2; LU 3.2.1	3.2; TU 3.2.1
How do the different F-35A alternatives and scenario impacts compare?	BO 3.1.2 through BO 3.15.2; Response NP-13	HO 3.1.2 through HO 3.15.2; Response NP-13	LU 3.1.2 through LU 3.15.2; Response NP-13	TU 3.1.2 through TU 3.15.2; Response NP-13
What is No Action?	2.5	2.5	2.5	2.5
Explain noise measures in the EIS.	3.2; Appendix B	3.2; Appendix B	3.2; Appendix B	3.2; Appendix B
What are the F-35A impacts on property values or property tax revenues?	3.9.2; BO 3.11.1.2; Appendix B.2.7; Response SO-13	3.9.2; HO 3.11.1.2; Appendix B.2.7; Response SO-13	3.9.2; LU 3.11.1.2; Appendix B.2.7; Response SO-13, SO-31	3.9.2; TU 3.11.1.2; Appendix B.2.7; Response SO-13
Could residents lose their homes or businesses as a result of F-35A noise?	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26	Response SO-3, SO-18, SO-26
Test flyovers of communities are needed for a community survey before an EIS can be prepared.	Response SO-7, NP-13	Response SO-7, NP-13	Response SO-7, NP-13	Response SO-7, NP-13
Would the Air Force regulate flight altitudes, training times, takeoffs and landings, or institute other mitigations to reduce noise impacts?	Response NP-33	Response NP-33	Response NP-33	Response NP-33
Will schools be retrofitted or closed due to noise impacts?	2.8.3; Response SO-32, SO-37		2.8.3; Response SO-32, SO-37	2.8.3; Response SO-32, SO-37
How would the basing of the F-35A mission affect Arizona State land use laws regarding property near a military airport?			LU 3.2.1; LU 3.2.2; LU 3.10.1; LU 3.10.2	TU 3.10.3.1
Can the F-35A train in local airspace?	2.2.1; BO 2.2	2.2.1; HO 2.2	2.2.1; LU 2.2	2.2.1; TU 2.2
What sonic booms are associated with the F-35A?	BO 3.2.2	HO 3.2.2	LU 3.2.2	TU 3.2.2
What would the impact on recreational areas under the airspace be?	BO 3.10.2.1; BO 3.10.2.2	HO 3.10.2.1; HO 3.10.2.2	LU 3.10.2.1; LU 3.10.2.2	TU 3.10.2.1; TU 3.10.2.2
What low-level overflights would occur?	BO 2.2.1; BO 3.1.2	HO 2.2.1; HO 3.1.2	LU 2.2.1; LU 3.1.2	TU 2.2.1; TU 3.1.2
What would the impact on communities under the airspace be?	BO 3.10.1; BO 3.10.2; BO 3.11.1; BO 3.11.2; Response SO-6, SO-45	HO 3.2.2; HO 3.10.1; HO 3.10.2; HO 3.11.1; HO 3.11.2; Response SO-6, SO-20, SO-45	LU 3.10.1; LU 3.10.2; LU 3.11.1; LU 3.11.2; Response SO-6, SO-45	TU 3.10.1; TU 3.10.2; TU 3.11.1; TU 3.11.2; Response SO-6, SO-45

Issues and Questions	*Section in EIS or Comment Response Where Issue Is Addressed*			
	Boise AGS	***Holloman AFB***	***Luke AFB***	***Tucson AGS***
How do we make damage claims for noise impacts?	BO 2.8.4	HO 2.8.4	LU 2.8.4	TU 2.8.4
What would the air quality emissions and air pollution effects be?	BO 3.3	HO 3.3	LU 3.3	TU 3.3
How will F-35As use Davis-Monthan AFB?				2.3.4; TU 3.1.1.1; TU 3.4.1.2
What are the safety risks from pilot error or mechanical malfunction?	BO 3.4.1; BO 3.4.2	HO 3.4.1; HO 3.4.2	LU 3.4.1; LU 3.4.2	TU 3.4.1; TU 3.4.2
How are pilots trained for such a sophisticated aircraft?	2.4.3	2.4.3	2.4.3	2.4.3
Are there special safety issues associated with a single-seat, single-engine aircraft?	BO 3.4.2.2	HO 3.4.2.2	LU 3.4.2.2	TU 3.4.2.2
What testing would occur before training aircraft beddown and flight over cities?	2.4.3.2	2.4.3.2	2.4.3.2	2.4.3.2
What chaff and flare use would occur with the F-35A?	2.4.5; BO 3.4.2.2	2.4.5; HO 3.4.2.2	2.4.5; LU 3.4.2.2	2.4.5; TU 3.4.2.2
Would the potential for fire increase with the F-35A?	2.4.5; BO 3.4.2.2; Response SO-8	2.4.5; HO 3.4.2.2; Response SO-8	2.4.5; LU 3.4.2.2; Response SO-8	2.4.5; TU 3.4.2.2; Response SO-8
Would jet fuel be dumped?	BO 3.4.2.2	HO 3.4.2.2	LU 3.4.2.2	TU 3.4.2.2
Would soils or water be impacted?	BO 3.5; BO 3.7	HO 3.5; HO 3.7	LU 3.5; LU 3.7	TU 3.5; TU 3.7
What would the impacts on wildlife and sensitive species be?	BO 3.6; BO 3.8; Appendix B.2.6	HO 3.6; HO 3.8; Appendix B.2.6	LU 3.6; LU 3.8; Appendix B.2.6	TU 3.6; TU 3.8; Appendix B.2.6
How would domestic and ranch animals be impacted?	2.8; Appendix B.2.6	2.8; Appendix B.2.6	2.8; Appendix B.2.6	2.8; Appendix B.2.6
What traditional or historic impacts would occur?	BO 3.9.1; BO 3.9.2	HO 3.9.1; HO 3.9.2	LU 3.9.1; LU 3.9.2	TU 3.9.1; TU 3.9.2
Would land use under the airspace be impacted?	BO 3.10.1; BO 3.10.2; BO 3.11.2	HO 3.10.1; HO 3.10.2; HO 3.11.2	LU 3.10.1; LU 3.10.2; LU 3.11.2	TU 3.10.1; TU 3.10.2; TU 3.11.2
How would existing land use statutes be affected?	3.2.2; BO 3.11.2.2	3.2.2	3.2.2; LU 3.2; LU 3.10	3.2.2; TU 3.10.3.1
What would the impacts on the local economy be?	BO 3.10.1.2; BO 3.10.2; BO 3.11.1.2	HO 3.10.1.2; HO 3.10.2; HO 3.11.1.2	LU 3.10.1.2; LU 3.10.2; LU 3.11.1.2	TU 3.10.1.2; TU 3.10.2; TU 3.11.1.2
How many jobs would be associated with the F-35A basing?	BO 3.11.1.2; Response SO-21, SO-25	HO 3.11.1.2; Response SO-21, SO-25	LU 3.11.1.2; Response SO-21, SO-25	TU 3.11.1.2; Response SO-21, SO-25
Would noise impact tourism or the ability to enjoy the natural environment?	BO 3.10.2	HO 3.10.2	LU 3.10.2	TU 3.10.2
Who will pay for the impact on school funding and neighborhoods?	2.8.2	2.8.2	2.8.2	2.8.2
A comprehensive community cost-benefit study is needed.	Response DO-10, SO-13	Response DO-10, SO-13	Response DO-10, SO-13	Response DO-10, SO-13
How would minorities and low-income populations be impacted?	BO 3.12.1; BO 3.12.2	HO 3.12.1; HO 3.12.2	LU 3.12.1; LU 3.12.2	TU 3.12.1; TU 3.12.2
What would the health impacts on children and young adults be?	BO 3.12.2.2; Appendix B.2.5	HO 3.12.2.2; Appendix B.2.5	LU 3.12.2.2; Appendix B.2.5	TU 3.12.2.2; Appendix B.2.5
What would the noise effects on schools or children be?	BO 3.2.1.2; BO 3.12.2.2; Appendix B.2.5	HO 3.2.1.2; HO 3.12.2.2; Appendix B.2.5	LU 3.2.1.2; LU 3.12.2.2; Appendix B.2.5	TU 3.2.1.2; TU 3.12.2.2; Appendix B.2.5

TU 3.0 Tucson AGS Affected Environment/Environmental Consequences

TU 3.1 Airspace Management and Use

TU 3.1.1 Base

TU 3.1.1.1 Base Affected Environment

The airspace resource area definition and analysis methodology, as well as key terms and definitions, are discussed in detail in Chapter 3, Section 3.1. Tucson AGS is sited on the southern part of TUS. TUS is a full service joint military/civilian airfield with three runways. Air traffic control (ATC) services are provided by an FAA Terminal Radar Approach Control Facility (TRACON), which controls the airspace surrounding the airport, and an Air Traffic Control Tower responsible for runway operations and air traffic within the Class D controlled space.

The TUS is located within Class C airspace, which is typically established within a 5-nautical-mile (NM) radius of those airports having a moderate level of air traffic and an operational control tower. However, due to the close proximity of Davis-Monthan AFB, a single "double-bubble"-shaped Class C airspace encompasses both installations. Class C airspace enhances aviation safety within the airport environment by requiring all aircraft, including Visual Flight Rule traffic transiting through this airspace, to establish two-way communications with ATC prior to entering this area (generally about 20 miles out). All aircraft are also required to have a Mode C transponder that provides ATC with the radar flight tracking and altitude information required to provide separation between all aircraft operating within this terminal airspace. The TUS/Davis-Monthan AFB Class C airspace is depicted on the Phoenix Sectional Aeronautical Chart published by the U.S. Department of Transportation, FAA.

TUS's elevation is 2,643 feet MSL; it covers an area of 8,244 acres and contains three runways:

- Runway 11L/29R is 10,996 × 150 feet.
- Runway 11R/29L is 8,408 × 75 feet.
- Runway 3/21 is 7,000 × 150 feet.

Instrument approach procedures are established for Runway 11L/29R. The three runway layout and navigational aids available provide a number of VHF Omni-Directional Radio Range (VOR)/Tactical Air Navigation (TACAN)/Radar Navigation (RNAV) instrument approach and departure procedures established for use by either civil and military aircraft under visual or instrument weather conditions.

Runway 11L is the preferred runway and is used for most commercial and military air traffic, due to prevailing winds. Occasional winds force commercial and military use of Runway 29R, and even less frequently, with strong winds from the south, Runway 21 will be used. Runway 11R-29L is too narrow (only 75 feet wide) for most commercial and military aircraft. With strong northeasterly winds, Runway 3 can be used by civil aviation.

For the 12-month period ending December 31, 2009, the airport had 199,289 aircraft operations, an average of 546 per day; approximately 14 percent of those were military aircraft operations.

Table TU 2.1–1 shows the baseline and projected use of TUS for the different 162 FW F-35A aircraft scenarios.

The 162 FW has an agreement with the TAA limiting the number of aircraft operations to no more than 40,000 per year (TAA and 162 FW 1994). This agreement also limits the number of 162 FW takeoffs that involve afterburners to no more than 10 percent of annual takeoffs. In 2009, the 162 FW executed 26,280 airfield operations.

Live munitions are not stored at Tucson AGS; therefore, for live-fire operations, aircraft must transit to Davis-Monthan AFB for weapons loading and takeoff. Davis-Monthan AFB has a single runway (12/30) that is 13,643 feet long and 200 feet wide, with a field elevation of 2,704 feet MSL. TACAN, Instrument Landing System (ILS), and Precision Approach Radar (PAR) instrument approaches are available to both Runway 12 and Runway 30, and student instrument approaches are conducted on those runways.

TU 3.1.1.2 Base Environmental Consequences

TUS projects an annual average growth rate of approximately 2 percent (compounded) for all airport operations except military, as those are capped by the existing agreement at 40,000 per year.

Table TU 2.0–1 provides information on projected operations at TUS for three possible F-35A aircraft scenarios. Scenario T2 would result in 30,714 sortie-operations per year. This activity level does not exceed the maximum allowed under the agreement with the TAA. Projected sortie-operations under Scenario T3 would be 43,208. The F-35A operations would constitute 38,999 of those projected military operations and would necessitate renegotiation of the existing agreement. Under any F-35A aircraft scenario, F-35A projected afterburner takeoffs at Tucson AGS would constitute approximately 7 percent of all 162 FW takeoffs, well under the 10 percent limit.

TU 3.1.2 Airspace

TU 3.1.2.1 Airspace Affected Environment

Special Use Airspace and Military Training Routes

Numerous blocks of SUA and ASU currently support flight training activities of the 162 FW and are necessary to support F-35A training missions. The SUA and ASU consist of numerous MOAs, ATCAAs, MTRs, and restricted airspace. The location of each airspace entity is depicted in Figure TU 2.2–1 and described in Table TU 3.1–1. Baseline and projected annual sortie-operations are depicted in Table TU 2.2–1. The Ruby, Outlaw, and Jackal MOAs/ATCAAs, and the Rustler Airspace are scheduled and managed by 162 FW. Rustler Airspace is a combination of the entire Morenci MOA/ATCAA and a large part (southwestern 80 percent) of the Reserve MOA and associated ATCAA, and is a name used to facilitate scheduling with Albuquerque ARTCC. North TAC and South TAC Ranges in R-2301E and the Sells MOA/ATCAA are

currently utilized by 162 FW aircraft, but are managed and scheduled by the 56 FW at Luke AFB. The Tombstone MOAs/ATCAAs are managed by the 355th Fighter Wing (355 FW) at Davis-Monthan AFB and occasionally utilized by the 162 FW. A cooperative scheduling agreement between the 56 FW at Luke AFB, 355 FW at Davis-Monthan AFB, and 162 FW at Tucson AGS assures all three units sufficient access to the region's airspace to accomplish their training goals.

Also, note that the International Civil Aviation Organization (ICAO) has decreed that from January 1, 2008, onward, all Air Traffic Controllers and Flight Crew Members engaged in or in contact with international flights must be proficient in the English language as a general spoken medium and not simply have a proficiency in standard ICAO radio communication phraseology (ICAO 2010). Therefore, pilots from partner nations that will train with the 162 FW will communicate in English with ATC and from cockpit to cockpit.

Table TU 3.1–1. Description of Primary Use Airspace for Projected F-35A Use

Airspace	*Airspace Type*	*Airspace Floor*	*Airspace Ceiling*	*Airspace Published Use Times*	*Managed By*
Ruby	MOA/ ATCAA	10,000 feet MSL	FL510	0600–1900[1]	162 FW
Outlaw	MOA/ ATCAA	8,000 feet MSL or 3,000 feet AGL, whichever is higher	FL510	0700–1800[2]	162 FW
Jackal	MOA/ ATCAA	11,000 feet MSL or 3,000 feet AGL, whichever is higher	FL510	0700–1800[3]	162 FW
Tombstone A	MOA	500 feet AGL	UTBNI 14,500 feet MSL	0600–2100[1]	355 FW
Tombstone B	MOA	500 feet AGL	UTBNI 14,500 feet MSL	0600–2100[1]	355 FW
Tombstone C	MOA/ ATCAA	14,500 feet MSL	FL510	0600–2100[1]	355 FW
Sells	MOA	3,000 feet AGL	UTBNI FL180	0600–1900[1]	56 FW
Rustler	ATCAA[5]	FL180	FL510	Coordinate with ABQ ARTCC	ABQ ARTCC
R-2301E	Restricted Area	Surface	FL240	0630–2400[5]	56 FW
VR-263	MTR	100 feet AGL	3,000 feet AGL	Continuous	162 FW

[1] Monday through Friday; other times by NOTAM.
[2] Monday through Friday; 1800–2200 Monday through Friday by NOTAM.
[3] Monday through Friday; 1800–2200 Monday through Friday by NOTAM; intermittent weekends by NOTAM.
[4] Daily; other times by NOTAM.
[5] ATCAA is over all of Morenci and parts of Reserve MOAs and is scheduled in conjunction with both MOAs.
Key: ABQ=Albuquerque; NOTAM=Notice to Airman; UTBNI=up to but not including.

Several MTRs are currently used by 162 FW F-16s for conducting low-level training. Only one of those routes, VR-263, would be primarily utilized by the F-35As. Pertinent route description information is shown in Table TU 3.1–1. Baseline and projected usage are shown in Table TU 2.2–2.

Auxiliary Airfield

Libby AAF. Libby AAF, identified as the auxiliary airfield for 162 FW F-35A aircraft, is a joint use military-civilian facility 43 NM southeast of TUS, which is heavily utilized by the F-16s from the 162 FW for overhead patterns, go-around/closed patterns, simulated flameout (SFO) approaches, visual straight ins, touch-and-go landings, and instrument approaches. Most flight operations conducted at Libby AAF are military and involve fixed-wing, rotary-wing, and unmanned aircraft system (UAS) operations. The primary runway is Runway 8-26, which is 12,001 feet long and 150 feet wide, with a field elevation of 4,719 feet MSL. TACAN, RNAV, VOR, ILS, and PAR instrument approaches are available to Runway 26, and TACAN, RNAV, and PAR approaches are available to Runway 8. Table TU 2.2–4 shows baseline and projected operations at Libby AAF.

TU 3.1.2.2 Airspace Environmental Consequences

Special Use Airspace and Military Training Routes

Table TU 2.2–1 shows the projected number of sortie-operations that would be conducted cumulatively under Scenarios T1 through T3, and the baseline includes additional operations flown by all aircraft. Projected operations by aircraft other than F-35As and F-16s are not expected to change.

With the decrease in Air Force F-16s at Tucson AGS under Scenario T1, annual sortie-operations in the Ruby MOA/ATCAA would decrease from baseline totals by 15 percent; annual sortie-operations would increase by 25 percent under Scenario T2 and by 71 percent under Scenario T3. Annual sortie-operations in the Outlaw MOA/ATCAA would decrease by 22 percent compared with baseline totals under Scenario T1 and would increase by 10 percent under Scenario T2 and by 48 percent under Scenario T3.

Annual sortie-operations in the Jackal MOA/ATCAA would increase by 7 percent over the baseline under Scenario T1. Sortie-operations, as a result of Scenario T2, would increase by 69 percent, and Scenario T3 would result in exceeding the sortie-operations baseline totals by 137 percent.

Annual sortie-operations totals in the Sells MOA/ATCAA would decrease by 33 percent under Scenario T1, decrease by 44 percent under Scenario T2, and decrease by 35 percent under Scenario T3.

Baseline sortie-operations numbers in Rustler Airspace would decrease by 37 percent under Scenario T1, decrease by 12 percent under Scenario T2, and increase by 16 percent under Scenario T3.

Annual sortie-operations in the Tombstone MOAs/ATCAAs would decrease from baseline totals by 53 percent under Scenario T1, 51 percent under Scenario T2, and 43 percent under Scenario T3.

Annual sortie-operations in the BMGR TAC ranges and BMGR R-2301E would decrease by 57 percent compared with baseline total under Scenario T1, by 61 percent under Scenario T2, and by 59 percent under Scenario T3.

A current waiver exists allowing supersonic operations down to 10,000 feet MSL in Sells MOA/ATCAA and down to 5,000 feet AGL in R-2301E, except over manned air-to-ground ranges where the minimum altitude for supersonic operations is 10,000 feet MSL. Sufficient time is available in those areas to support the training sorties during which supersonic operations of the remaining F-16s and up to 72 F-35A aircraft would occur. The 56 FW and 162 FW would need to ensure that projected supersonic operations are within limitations specified in that waiver or obtain a new waiver that covers the projected operations.

The beddown of up to 72 F-35A aircraft and their associated training activities could be accommodated within existing airspace without modification and with little to no impact on overall airspace management in the region, as long as existing scheduling efforts and agreements are continued.

The F-35As would use VR-263 as the primary use MTR. Projected use of VR-263 would decrease by 54 percent under Scenario T1, by 32 percent under Scenario T2, and by 4 percent under Scenario T3. Table TU 2.2–2 provides baseline and projected sortie-operations.

Auxiliary Airfield

Libby AAF would continue to be utilized by F-35As in a similar manner to the current operations conducted by 162 FW F-16s. Table TU 2.2–4 shows both the baseline and projected operations for the three different F-35A aircraft scenarios. Under Scenario T1, projected F-35A operations would result in a net increase over current F-16-driven airfield operations totals of approximately 3 percent. Under Scenario T2, airfield operations would increase by 13 percent; under Scenario T3, operations would increase by 29 percent.

TU 3.2 Noise

Noise, which is defined simply as unwanted sound, has the potential to affect several environmental resource areas. Comments received during scoping covered a broad range of issues and requested a comprehensive presentation of noise effects. This section will describe noise effects on human annoyance and health, as well as physical effects on structures in the Tucson AGS region of influence (ROI). Noise impacts on biological, land use, socioeconomic, and cultural resources are described briefly in this section and are discussed in more detail in separate sections dealing with those environmental resources. A discussion of the methods used to assess noise impacts throughout this EIS can be found in Chapter 3, Section 3.2. A brief summary of the different measurements used to quantify noise is provided for convenience and follows.

Different noise measurements (or metrics) quantify noise. These noise metrics are as follows:

- DNL (Day–Night Average Sound Level) combines the levels and durations of noise events, the number of events over a 24-hour period, and more-intrusive nighttime noise to calculate an average noise exposure.
- DNL_{mr} (Onset Rate-Adjusted Day–Night Average Sound Level) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace units, DNL_{mr} is calculated based on the average number of operations per day in the busiest month of the year.
- CDNL (C-Weighted Day–Night Average Sound Level) is a day–night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of single impulsive noises, such as sonic booms.
- L_{max} (Maximum Noise Level) is the highest noise level reached during an event, such as an aircraft overflight.
- SEL (Sound Exposure Level) accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.
- SEL_r (Onset Rate-Adjusted Sound Exposure Level) is the same as SEL but accounts for the onset-rate of a sound, which can make a noise seem louder.
- L_{eq} (Equivalent Sound Level) represents aircraft noise levels averaged over a specified time period. The L_{eq} is useful for considering noise effects such as during a school day ($L_{eq(SD)}$; 7:00 a.m. to 4:00 p.m.).

Different metrics measure different impacts. Annoyance represents the most common noise impact. There is a correlation between the percentages of people in a community highly annoyed and the average noise level measured using the DNL metric. Impulsive noise, as measured in CDNL, is annoying to more people than DNL.

TU 3.2.1 Base

TU 3.2.1.1 Base Affected Environment

Tucson AGS supports a contingent of F-16 aircraft and is also used by several types of transient aircraft. TUS, which is collocated with Tucson AGS, accommodates a wide variety of civilian commercial and general aviation aircraft types. TUS is currently in the process of updating its Part 150 Noise Compatibility Study, which will identify noise impacts and develop noise abatement and land use options to help minimize noise impacts on the surrounding community. The TAA has already taken steps to minimize noise impacts on the surrounding community, including relocating the main runway to mitigate noise impacts on communities to the northwest and implementing a Sound Insulation Program that will, once it is completed, result in reduced interior noise levels in nearly 1,400 homes. Adoption of any noise abatement measures by the ANG would be voluntary and would become binding only through a separate written agreement by the ANG.

The baseline noise contours shown in Figure TU 3.2–1 reflect aircraft operations for the current level of operations at Tucson AGS and were generated using the FAA's Integrated Noise Model. However, as noted in the TUS Part 150 Noise Compatibility Study, the number of civilian aircraft operations per year is predicted to continue to increase in coming years.

Under baseline conditions, approximately 500 acres and 407 residents in areas not owned by Tucson AGS or TUS are affected by noise levels exceeding 65 decibels (dB) DNL (see Table TU 3.2–1). Approximately 2,527 acres on the installation or airport are affected by noise levels exceeding 65 dB DNL. Noise levels at several representative noise-sensitive locations under baseline conditions are presented in Table TU 3.2–3. The locations of the representative noise-sensitive locations can be seen in Figure TU 3.2–1. The areas in the vicinity of the representative locations would experience similar aircraft noise levels and noise impacts.

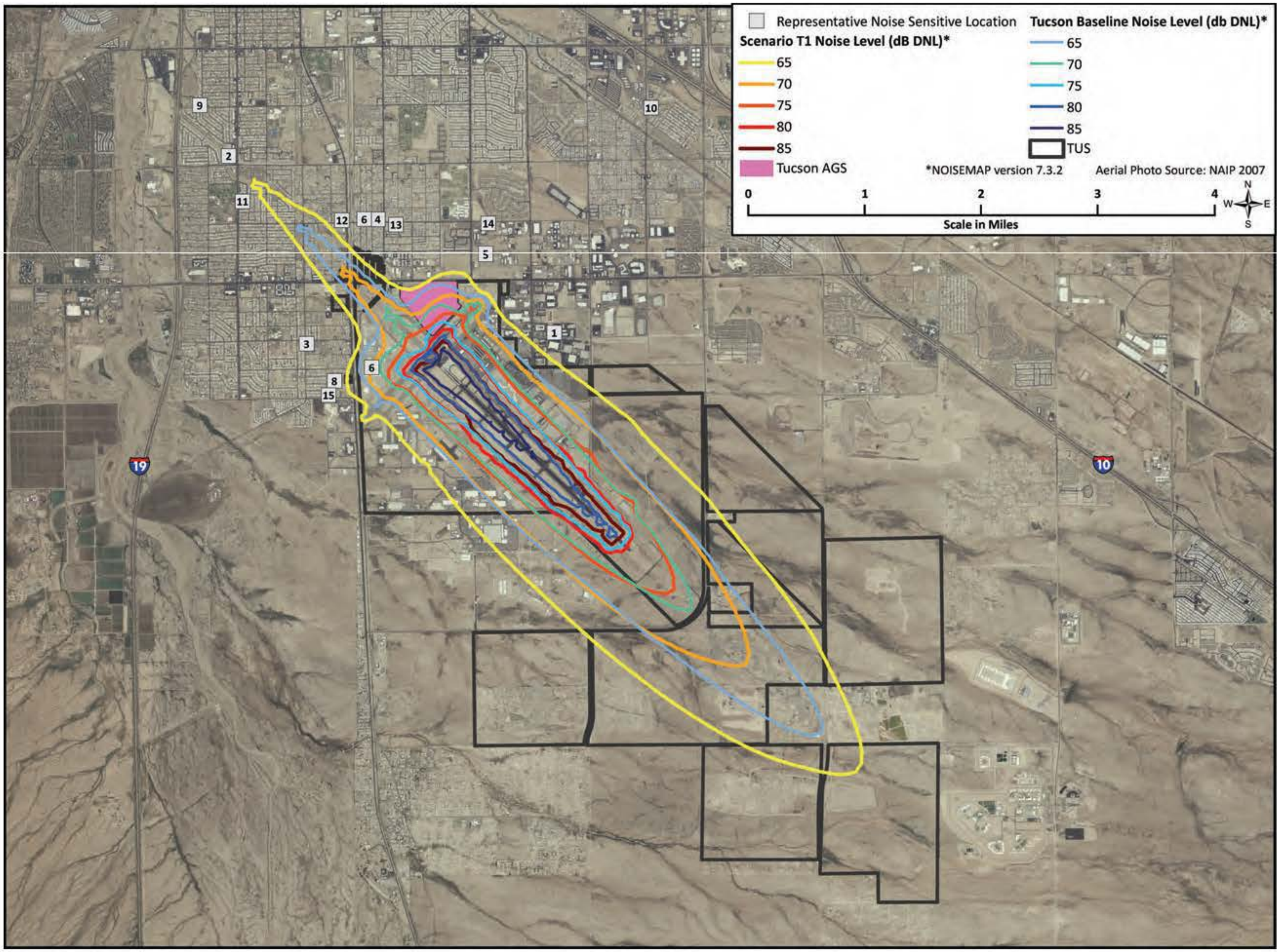


Figure TU 3.2–1. Scenario T1 and Baseline Noise Contours

Table TU 3.2–1. Population and Acreage Under Noise Contours Near Tucson AGS, Baseline Conditions, and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation/ Airport)*		*Population Affected (On-Installation/ Airport)*		*Total Area Affected (Off-Installation/ Airport)*		*Total Area Affected (On-Installation/ Airport)*	
	Number	**Change**	**Number**	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions								
Total ≥ 65	**407**	**N/A**	**0**	**N/A**	**500**	**N/A**	**2,527**	**N/A**
65–69	407	N/A	0	N/A	445	N/A	1,260	N/A
70–74	0	N/A	0	N/A	55	N/A	628	N/A
75–79	0	N/A	0	N/A	0	N/A	334	N/A
80–84	0	N/A	0	N/A	0	N/A	198	N/A
≥ 85	0	N/A	0	N/A	0	N/A	107	N/A
Scenario T1 (24 Aircraft)								
Total ≥ 65	**1,918**	**1,511**	**0**	**0**	**1,200**	**700**	**3,842**	**1,315**
65–69	1,902	1,495	0	0	866	421	1,759	499
70–74	16	16	0	0	269	214	934	306
75–79	0	0	0	0	62	62	484	150
80–84	0	0	0	0	3	3	262	64
≥ 85	0	0	0	0	0	0	403	296
Scenario T2 (48 Aircraft)								
Total ≥65	**4,378**	**3,971**	**0**	**0**	**1,942**	**1,442**	**5,388**	**2,861**
65–69	4,068	3,661	0	0	1,334	889	2,496	1,236
70–74	310	310	0	0	437	382	1,344	716
75–79	0	0	0	0	146	146	664	330
80–84	0	0	0	0	25	25	348	150
≥ 85	0	0	0	0	0	0	536	429
Scenario T3 (72 Aircraft)								
Total ≥ 65	**8,534**	**8,127**	**0**	**0**	**2,938**	**2,438**	**6,443**	**3,916**
65–69	7,817	7,410	0	0	1,996	1,551	2,977	481
70–74	717	717	0	0	660	605	1,594	966
75–79	0	0	0	0	230	230	809	475
80–84	0	0	0	0	51	51	432	234
≥ 85	0	0	0	0	1	1	631	524

Under baseline conditions, all of the locations studied experience noise levels below 65 dB DNL, with the exception of the Pima Community College of Aviation Technology (Location No. 6). Noise events exceeding 50 dB L_{max} have potential to interrupt speech. Noise levels indoors are reduced from outdoor levels due to structural noise attenuation by approximately 15 dB with windows open and 25 dB with windows closed. Under baseline conditions, the average number of indoor noise events per hour during daytime hours exceeding 50 dB L_{max} among all locations studied is 9 with windows closed and 3 with windows open. The Pima Community College of Aviation Technology is exposed to $L_{eq(SD)}$ (i.e., L_{eq} between 7:00 a.m. and 4:00 p.m.) of 71 dB, but 65 dB $L_{eq(SD)}$ is not exceeded at any of the other four schools studied. The probability of being awakened at least once per night was estimated for each of the locations studied under windows closed and windows open conditions using the methodology described in Chapter 3, Section 3.2. If windows are left open, the percentage of persons awakened by aircraft noise at least once per night would range from 3 to 36 percent at the locations studied under baseline conditions. If windows are closed, the probability of persons being awakened at the locations studied would be between 0 and 21 percent.

Table TU 3.2–2. Projected Noise Levels from Currently Based and F-35A Aircraft at a Specific Location on the Ground

Aircraft	*Engine*	*Operation Type*	*Engine Power*	*Airspeed (knots)*	*Altitude (feet AGL)*	*Slant Distance (feet)*	*SEL (dB)*
F-35A (Afterburner power)	F-135PP	Departure	100% ETR	250	2,036	7,457	95
F-35A (Military power)	F-135PP		100% ETR	300	1,670	7,350	95
F-16C (Afterburner power)	F100-PW-220		91% NC	300	2,025	7,438	88
F-16C (Military power)	F100-PW-220		91% NC	300	2,025	7,438	86
F-35A	F-135PP	Arrival	40% ETR	180	371	7,143	79
F-16C	F100-PW-220		80% NC	145	297	7,138	70
F-35A	F-135PP	Closed Pattern	40% ETR	210	1,422	1,533	94
F-16C	F100-PW-220		80% NC	250	1,499	1,606	85

Note: Noise levels presented were calculated at Ocotillo Elementary School for the representative departure, arrival, or closed pattern flight that comes closest to the location. Actual individual overflight noise levels vary from the noise levels listed because of variations in aircraft configuration, flight track, altitude, and atmospheric conditions. Representative noise levels were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate noise contours.
Key: ETR=engine thrust request; NC=core engine speed.

Under baseline conditions, no buildings on TUS or Tucson AGS are exposed to noise greater than 80 dB DNL. Employees at Tucson AGS are protected by DoD occupational hearing protection regulations and employees at TUS are protected by Occupational Safety and Health Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH) occupational hearing protection regulations. Noise-induced permanent threshold shift (NIPTS) risk is minimal.

TU 3.2.1.2 Base Environmental Consequences

Noise impacts under each of the beddown scenarios were modeled using DoD's NOISEMAP Version 7.3 for military aircraft noise and the FAA's Integrated Noise Model for civilian aircraft noise. Figures TU 3.2–1, TU 3.2–2, and TU 3.2–3 show DNL contours under Scenarios T1, T2, and T3, respectively, overlaid on baseline noise contours. The off-installation area affected by noise levels greater than 65 dB DNL would increase by approximately 700 acres under Scenario T1, 1,442 acres under Scenario T2, and 2,438 acres under Scenario T3 (see Table TU 3.2–1). The area affected by noise levels greater than 65 dB DNL on the installation or airport would increase by 1,315 under Scenario T1, 2,861 under Scenario T2, and 3,916 under Scenario T3. The estimated total number of off-installation residents affected by noise levels exceeding 65 dB DNL would increase by an estimated 1,511 persons under Scenario T1, 3,971 persons under Scenario T2, and 8,127 persons under Scenario T3. There are no residences on Tucson AGS or TUS. Persons experiencing an increase in aircraft noise level would be more likely to become annoyed by the noise, as described in Chapter 3, Table 3–3. Persons not within the 65 dB DNL noise contour would experience aircraft noise, although with less frequency and/or intensity, and could become highly annoyed as a result of the noise. As noted in Section 3.2, certain persons are more sensitive than others. Persons with autism, for example, are often very strongly affected by sudden noises (Grandin 1991; Tang et al. 2002*)*. The estimates of population impacted by elevated noise levels in Table TU 3.2–1 represent the best available data from the 2010 census. Off-installation populations were estimated by proportioning the area of the census blocks affected by noise contours. This method counts permanent residents only, and does not estimate persons residing in hotels and other temporary accommodations.

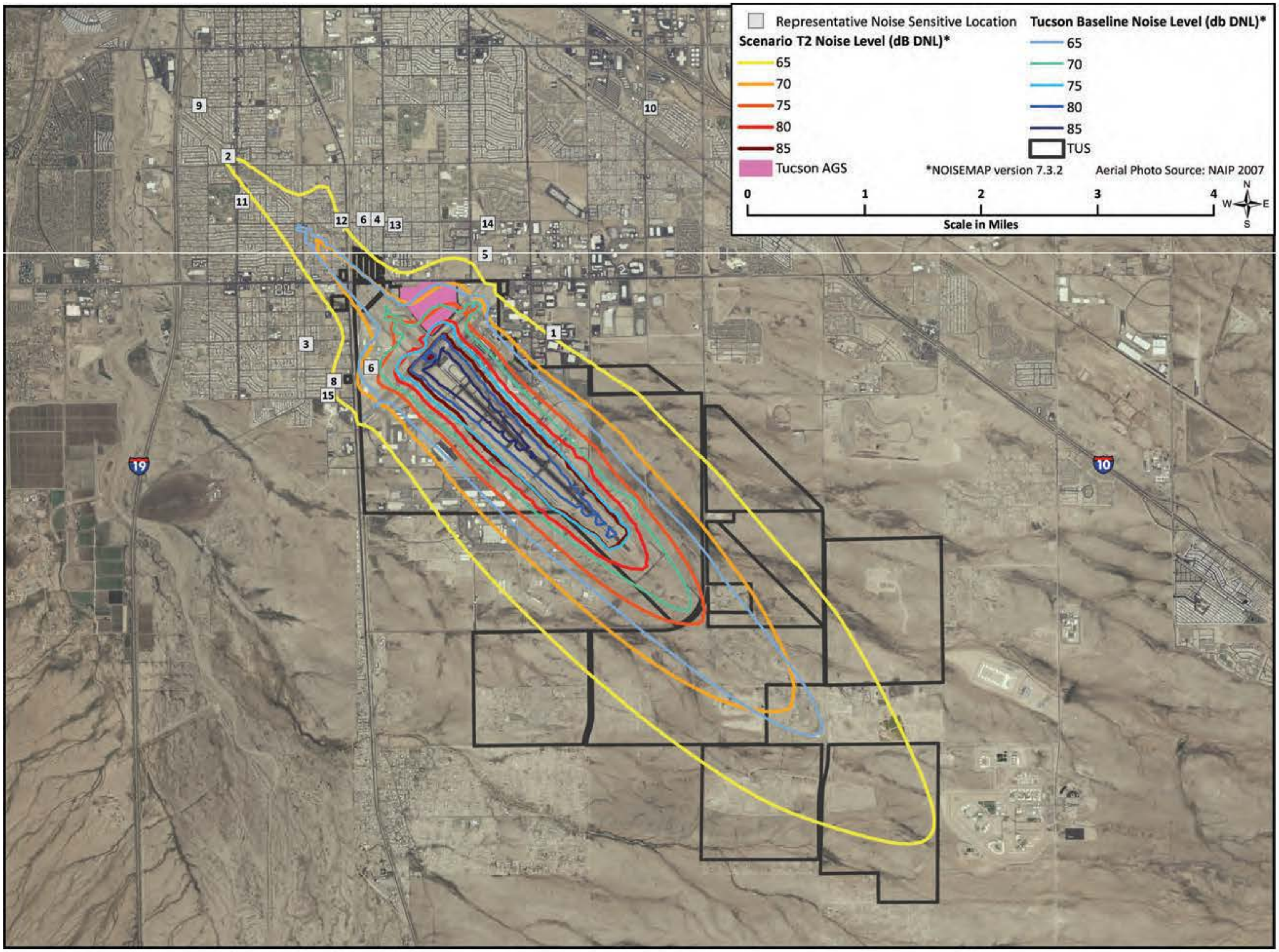


Figure TU 3.2–2. Scenario T2 and Baseline Noise Contours

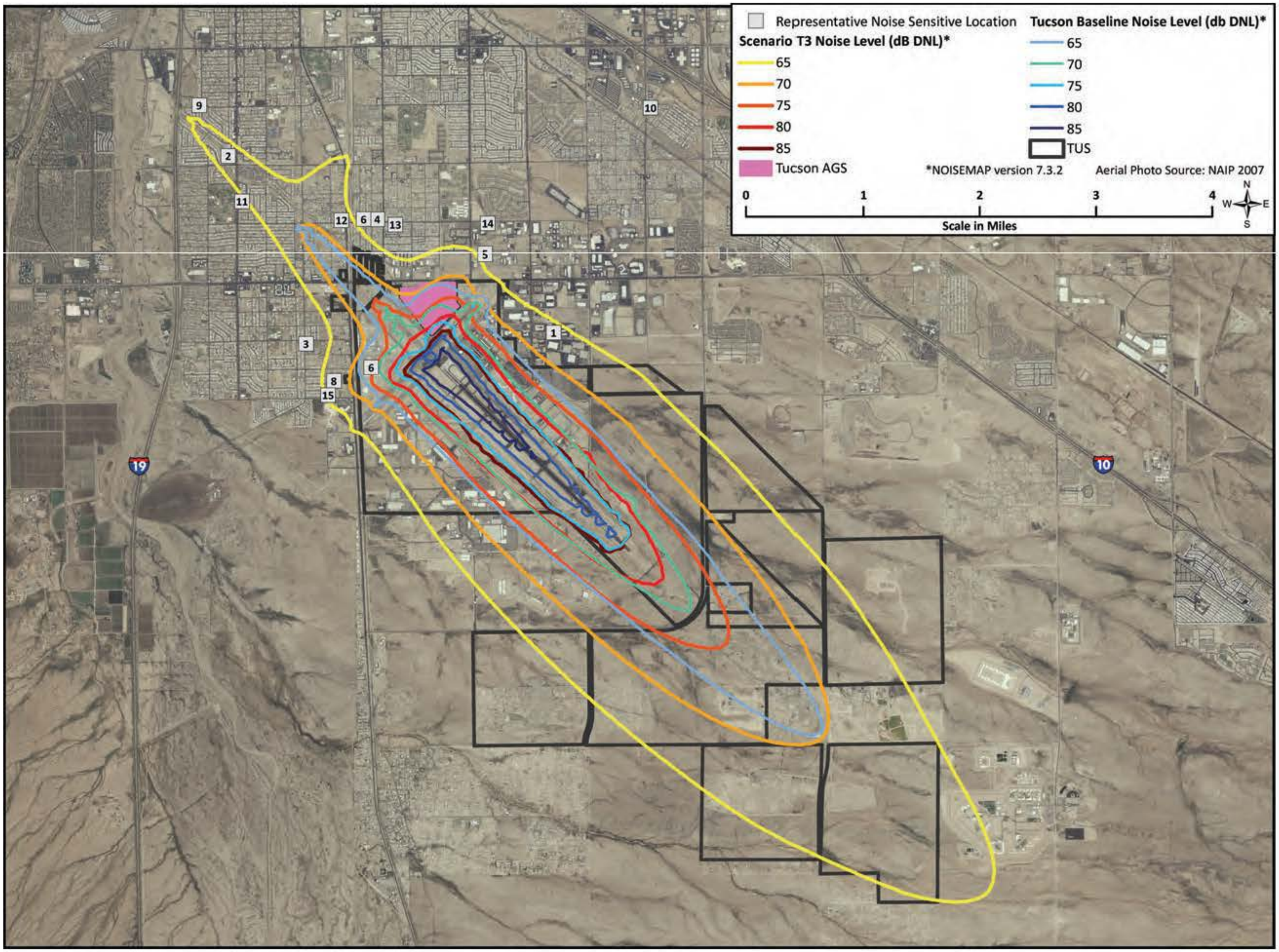


Figure TU 3.2–3. Scenario T3 and Baseline Noise Contours

Table TU 3.2–2 lists noise levels (SEL) associated with individual F-16C and F-35A aircraft overflights at a single location on the ground for purposes of comparison. The locations of aircraft ground tracks, as well as aircraft altitudes, airspeeds, and engine power settings used in this analysis, are representative of current F-16C or proposed F-35A operations based on pilot input. Noise levels were generated using NOISEMAP Version 7.3 and the same aircraft operations data used to generate the time-averaged noise levels (DNL contours) presented in this section. Note that actual overflight noise levels vary from flight to flight due to variations in aircraft location and configuration, as well as weather conditions and other factors. Under baseline conditions and beddown scenarios, aircraft sometimes fly together in groups known as "formations." Since SEL is an exposure-based metric, doubling the number of aircraft flying overhead results in a combined SEL that is 3 dB higher than the individual overflights. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL as listed in Table TU 3.2–2. Ocotillo Elementary School was selected as the reference point location for the analysis because it is near frequently used F-16C and proposed F-35A flight paths. Ocotillo Elementary School is located at the intersection of Drexel Road and Campbell Avenue. A typical F-35A departure in afterburner power generates an SEL that is approximately 7 dB higher than the SEL generated by a typical F-16C afterburner power departure at Ocotillo Elementary School. The SEL generated by a typical F-35A military power departure at the school is approximately 9 dB higher than the SEL generated by a typical F-16C military power departure. A typical F-35A arrival operation generates an SEL 9 dB higher than a typical F-16C arrival operation, and a typical F-35A closed pattern (during maneuvering in the traffic pattern) generates an SEL that is approximately 9 dB louder than an F-16C in the same mode.

Table TU 3.2–3 lists noise levels at several representative noise-sensitive locations under baseline conditions and Scenarios T1, T2, and T3. Representative locations include all on-installation schools, hospitals, and places of worship. Off-installation representative noise-sensitive locations include schools, hospitals, and places of worship that could be found in publicly available databases that lie within the 65 dB DNL noise contour line under any scenario. The locations are referred to as "representative" because the list is not intended to include all facilities that could be considered schools, hospitals, or places of worship. Many facilities accommodate several functions and therefore may not be classified as a school, hospital, or place of worship in publicly available databases. Furthermore, new facilities may open and old facilities may close, making it difficult to establish an all-inclusive list. Descriptions of noise levels at the representative noise-sensitive locations also provide information relevant to surrounding land uses. For this reason, all noise metrics were calculated for all locations studied, even though some metrics are not directly relevant to a specific facility listed. For example, the percentage of persons awakened at least once per night is not directly relevant to a school or place of worship, but is relevant to residential areas, which tend to be located near schools and places of worship.

DNL increases at locations analyzed would range from 1 to 4 dB under Scenario T1, 3 to 6 dB under Scenario T2, and 4 to 8 dB under Scenario T3. To put these increases in perspective, an increase in instantaneous sound level of between 3 and 10 dB is typically described as "noticeable," and an increase in instantaneous sound level of between 10 and 20 dB is typically described as "more than twice as loud." Under Scenario T1, the DNL at 1 of the 15 representative locations would exceed 65 dB. Under Scenario T2, the DNL at 5 of the locations would exceed 65 dB. Under Scenario T3, the DNL at 6 of the locations would exceed 65 dB.

Table TU 3.2–3. Noise Levels at Representative Noise-Sensitive Locations, Baseline Conditions and F-35A Beddown Scenarios

ID No.	General Description[1]	Outdoor DNL[2]	Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]	Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]	Outdoor $L_{eq(SD)}$	Percentage Awakened (windows open)[2]	Percentage Awakened (windows closed)[2]
Baseline Conditions							
1	University Physician's Healthcare	60	8	3	62	31	5
2	Arizona Academy of Leadership	63	14	4	61	31	21
3	Challenger Middle School	57	8	3	59	29	11
4	Children's Success Academy	56	8	3	57	24	2
5	Los Ranchitos Elementary School	57	8	3	59	27	5
6	Pima Community College of Aviation Technology	69	13	4	71	36	13
7	Asamblea Universal De Iglesias Pentecostales	56	8	4	58	26	4
8	Faith Assembly of God	61	9	3	63	27	5
9	Grace Temple Missionary Baptist Church	60	11	2	58	27	18
10	Holy Trinity Lutheran Church	47	4	0	47	3	1
11	Holy Trinity Lutheran Church	59	14	1	59	26	17
12	Iglesia De Dios Sinai	59	10	5	60	29	10
13	Lutheran Church of St. John The Baptist	56	8	3	58	22	0
14	Olivo Max & Encinas Manuel & Lopez	55	8	3	57	10	3
15	Tabernaculo Emanuel	59	8	3	60	21	4
Scenario T1 (24 Aircraft)							
1	University Physician's Healthcare	62 (2)	5 (-3)	2 (-1)	64 (2)	36 (4)	6 (1)
2	Arizona Academy of Leadership	64 (2)	13 (-1)	7 (3)	63 (3)	35 (4)	24 (3)
3	Challenger Middle School	58 (1)	6 (-2)	3 (0)	60 (1)	33 (4)	13 (2)
4	Children's Success Academy	59 (3)	5 (-3)	3 (0)	61 (3)	27 (4)	2 (0)
5	Los Ranchitos Elementary School	60 (2)	5 (-3)	3 (0)	62 (3)	31 (4)	5 (1)
6	Pima Community College of Aviation Technology	70 (1)	12 (-2)	4 (0)	72 (1)	40 (5)	15 (2)
7	Asamblea Universal De Iglesias Pentecostales	59 (3)	5 (-3)	3 (0)	61 (3)	29 (4)	4 (1)
8	Faith Assembly of God	63 (2)	6 (-3)	3 (0)	65 (2)	31 (4)	6 (1)
9	Grace Temple Missionary Baptist Church	61 (2)	12 (1)	4 (2)	61 (3)	31 (4)	21 (3)
10	Holy Trinity Lutheran Church	49 (2)	3 (-1)	1 (1)	49 (2)	4 (1)	1 (0)

ID No.	General Description[1]	Outdoor DNL[2]	Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]	Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]	Outdoor $L_{eq(SD)}$	Percentage Awakened (windows open)[2]	Percentage Awakened (windows closed)[2]
11	Holy Trinity Lutheran Church	62 (2)	13 (-1)	3 (2)	62 (3)	30 (4)	20 (3)
12	Iglesia De Dios Sinai	63 (4)	8 (-2)	4 (-1)	64 (4)	33 (4)	12 (2)
13	Lutheran Church of St. John The Baptist	58 (2)	5 (-3)	3 (0)	60 (3)	25 (3)	0 (0)
14	Olivo Max & Encinas Manuel & Lopez	58 (3)	5 (-3)	3 (-1)	60 (3)	11 (2)	3 (0)
15	Tabernaculo Emanuel	61 (3)	5 (-3)	3 (0)	63 (3)	25 (3)	5 (1)
Scenario T2 (48 Aircraft)							
1	University Physician's Healthcare	65 (5)	8 (0)	4 (0)	66 (5)	36 (4)	6 (1)
2	Arizona Academy of Leadership	65 (3)	16 (2)	9 (5)	65 (5)	35 (4)	24 (3)
3	Challenger Middle School	61 (4)	9 (0)	6 (3)	63 (4)	33 (4)	13 (2)
4	Children's Success Academy	61 (6)	8 (0)	6 (3)	63 (6)	27 (4)	2 (0)
5	Los Ranchitos Elementary School	62 (5)	8 (0)	6 (3)	64 (5)	31 (4)	5 (1)
6	Pima Community College of Aviation Technology	73 (3)	14 (1)	7 (3)	75 (3)	40 (5)	15 (2)
7	Asamblea Universal De Iglesias Pentecostales	62 (6)	8 (0)	6 (3)	64 (6)	29 (4)	4 (1)
8	Faith Assembly of God	65 (4)	9 (0)	6 (3)	67 (4)	31 (4)	6 (1)
9	Grace Temple Missionary Baptist Church	63 (3)	15 (4)	5 (4)	63 (5)	31 (4)	21 (3)
10	Holy Trinity Lutheran Church	50 (3)	6 (2)	3 (3)	51 (5)	4 (1)	1 (0)
11	Holy Trinity Lutheran Church	63 (4)	16 (1)	6 (5)	64 (5)	30 (4)	20 (3)
12	Iglesia De Dios Sinai	65 (6)	10 (1)	7 (2)	67 (7)	33 (4)	12 (2)
13	Lutheran Church of St. John The Baptist	61 (5)	8 (0)	6 (3)	63 (5)	25 (3)	0 (0)
14	Olivo Max & Encinas Manuel & Lopez	61 (5)	8 (0)	5 (2)	62 (6)	11 (2)	3 (0)
15	Tabernaculo Emanuel	64 (6)	8 (0)	6 (3)	66 (6)	25 (3)	5 (1)
Scenario T3 (72 Aircraft)							
1	University Physician's Healthcare	66 (6)	11 (3)	5 (2)	68 (6)	36 (5)	6 (1)
2	Arizona Academy of Leadership	67 (4)	19 (4)	12 (8)	67 (6)	36 (5)	24 (4)
3	Challenger Middle School	62 (5)	12 (3)	9 (6)	64 (5)	33 (5)	14 (2)
4	Children's Success Academy	63 (7)	11 (3)	9 (6)	65 (8)	28 (4)	3 (1)
5	Los Ranchitos Elementary School	64 (7)	10 (3)	9 (5)	66 (7)	32 (4)	6 (1)
6	Pima Community College of Aviation Technology	74 (5)	17 (4)	10 (6)	76 (5)	41 (5)	16 (3)

ID No.	General Description[1]	Outdoor DNL[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows open)[2]		Events ≥ 50 dB L_{max} per "daytime" hour (windows closed)[2]		Outdoor $L_{eq(SD)}$		Percentage Awakened (windows open)[2]		Percentage Awakened (windows closed)[2]	
7	Asamblea Universal De Iglesias Pentecostales	63	(8)	11	(3)	9	(6)	65	(8)	30	(4)	5	(1)
8	Faith Assembly of God	67	(6)	12	(3)	9	(6)	69	(6)	32	(5)	7	(1)
9	Grace Temple Missionary Baptist Church	64	(4)	18	(7)	7	(5)	64	(6)	32	(5)	21	(3)
10	Holy Trinity Lutheran Church	52	(4)	8	(4)	4	(4)	53	(6)	4	(1)	1	(0)
11	Holy Trinity Lutheran Church	64	(5)	19	(4)	9	(8)	65	(7)	31	(5)	20	(3)
12	Iglesia De Dios Sinai	67	(8)	13	(3)	10	(5)	68	(8)	34	(5)	13	(2)
13	Lutheran Church of St. John The Baptist	62	(6)	11	(3)	9	(6)	64	(7)	26	(4)	1	(1)
14	Olivo Max & Encinas Manuel & Lopez	62	(7)	10	(3)	7	(4)	64	(7)	12	(2)	3	(1)
15	Tabernaculo Emanuel	66	(7)	11	(3)	9	(6)	68	(7)	25	(4)	6	(1)

1 Locations presented in this table are provided to help understand the noise environment. This list is not meant to be inclusive of all noise-sensitive receptors in the affected environment.
2 Numbers in parentheses indicate delta relative to baseline conditions.

Overflights with sound levels exceeding 50 dB L_{max} have an increased likelihood of interrupting speech. Among all sensitive locations analyzed, the cumulative average number of indoor noise events per day exceeding 50 dB L_{max} would decrease by 21 percent under Scenario T1, increase by 9 percent under Scenario T2, and increase by 32 percent under Scenario T3 relative to baseline conditions with windows open. The number of events exceeding 50 dB L_{max} with windows closed would increase by 11 percent under Scenario T1, 100 percent under Scenario T2, and 189 percent under Scenario T3.

Under Scenario T1, the $L_{eq(SD)}$ (L_{eq} between 7:00 a.m. and 4:00 p.m.) would exceed 65 dB $L_{eq(SD)}$ only at Pima Community College of Aviation Technology (Location No. 6) but not at any of the other schools studied. Under Scenario T2, the Arizona Academy of Leadership (Location No. 2) and the Pima Community College of Aviation Technology would experience a noise level exceeding 65 dB $L_{eq(SD)}$ and under Scenario T3, all of the schools except Challenger Middle School (Location No. 3) would exceed 65 dB $L_{eq(SD)}$. Assuming that a typical school structure provides 25 dB outdoor-to-indoor noise level reduction with windows closed, schools experiencing an outdoor $L_{eq(SD)}$ that exceeds 65 dB may not meet the 2009 American National Standards Institute (ANSI) standard (40 dB in classroom) for at least a portion of 1 hour during a typical school day. F-35A operational schedules are not known at this time. In a hypothetical hour with twice the average daytime number of operations, L_{eq} would be 3 dB higher than the $L_{eq(SD)}$ listed in Table TU 3.2–3. Actual outdoor-to-indoor noise level reduction varies from school to school and between locations within individual schools.

Under all beddown scenarios, less than 6 percent of total aircraft operations at Tucson AGS/TUS would occur between the hours of 10:00 p.m. and 7:00 a.m., when most people are asleep. The probability of being awakened at least once per night by late-night aircraft noise was calculated using the methodology described in Chapter 3, Section 3.2, under

windows open and windows closed conditions. With windows open, the average percentage of persons awakened at least once per night by aircraft noise among all locations studied would increase by 14 percent relative to baseline conditions under Scenarios T1 and T2 and by 17 percent under Scenario T3. If windows are closed, the average percentage of persons awakened would increase by 16 percent under Scenarios T1 and T2 and by 23 percent under Scenario T3.

F-35A training at active-duty Air Force locations would not be expected to take place on the weekend (i.e., Saturday or Sunday). However, mission requirements would dictate the flying schedule. Other weekend flying and ANG weekend training is expected to continue at its current rate.

The risk of hearing loss under the beddown scenarios was assessed using the methodology described in Chapter 3, Section 3.2, and in greater detail in Appendix B. It was determined that no persons reside within the 80 dB DNL contour; therefore, the risk of hearing loss is minimal. On Tucson AGS, the risk of hearing loss among workers would be evaluated using the appropriate DoD component regulations for occupational noise exposure. OSHA and NIOSH occupational noise exposure regulations would continue to be enforced to protect employees of TUS. Under Scenarios T1, T2, and T3, one, two, and five structures, respectively on Tucson AGS and TUS would be affected by noise greater than 80 dB DNL.

F-35A flights to Davis-Monthan AFB would be infrequent (up to 108 per year under Scenario T3) to support one mission per student pilot involving use of live munitions. This frequency of use, equating to about two flights per week, is similar to the frequency of use of other transient users of Davis-Monthan AFB and represents a continuation of practices currently conducted by 162 FW F-16 jets. Sound levels generated by the F-35A would be similar to the F/A-18E/F aircraft that sometimes use Davis-Monthan AFB in a transient capacity. F-35A sound levels at a representative altitude and distance are shown in Table TU 3.2–2. F-35A, F-15, and A-10 sound levels in standard configurations at several altitudes are shown in Chapter 3, Tables 3–1 and 3–2. Individual flights to Davis-Monthan AFB may be annoying, but effects on overall time-averaged noise level would be minimal.

As F-35A noise levels would not exceed 130 dB in any 1/3-octave frequency band at distances of greater than 250 feet, no damage to structures is expected to occur as a result of F-35A subsonic noise (CHABA 1977). The term ‘frequency bands’ refers to noise energy in a certain range of frequencies and is similar in concept to frequency bands employed on home stereo equalizers to control relative levels of bass and treble. Noise energy in certain frequency bands has increased potential to vibrate and/or damage structures. Furthermore, studies conducted on vibrations induced by subsonic aircraft overflights generating similar noise levels to the F-35A in ancient Anasazi ruins indicate that vibrations would not occur at or near potentially damaging levels. Additional discussion of the effects of noise on cultural resources and ancient fragile structures can be found in Section TU 3.9.

Indirect impacts of noise on land use patterns could potentially occur, although it is impossible to accurately predict exactly what form the impact would take. As discussed in detail in Section TU 3.10, implementation of certain scenarios would result in additional existing land uses becoming incompatible with noise due to the increase in noise level.

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include non-auditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines. More-specific discussions on noise effects on animal species can be found in Sections TU 3.6, TU 3.7, and TU 3.8.

Many factors affect the market value of real property. While qualities of the property itself, surrounding properties, and the local real estate market are clearly the primary determinants of value, ambient noise levels could also play a role in determining market value. The effect of ambient noise level on real property market value has been studied extensively, but results have been contradictory. More-specific discussions on the effect of noise on real property market value can be found in Section TU 3.11.

Any claims from Air Force–related damage would begin by contacting the Tucson AGS Public Affairs Office with details of the claim. The Air Force would then investigate to establish the exact nature and extent of the damage.

TU 3.2.2 Airspace

TU 3.2.2.1 Airspace Affected Environment

Within MOAs, ATCAAs, and Restricted Areas, training flights are typically widely dispersed and random. Flight operations are constrained only by the boundaries of the airspace and any restrictions on training in the form of designated avoidance areas. The Air Force has developed the MOA-Range NOISEMAP (MR_NMAP) program to calculate subsonic aircraft noise in these areas (Lucas and Calamia 1996). MR_NMAP can also calculate noise levels beneath MTRs where flight paths are restricted to a designated corridor. Subsonic aircraft noise levels associated with operations in the primary use airspace were calculated using MR_NMAP and are shown in Table TU 3.2–4. Noise was not explicitly computed for occasional use airspace because of the low amount of use. The number of operations conducted in these occasional use airspace units is so low that their influence on the cumulative noise is negligible. The areas beneath the primary use MOAs/MTRs do not exceed 65 dB DNL_{mr} under baseline conditions.

Military aircraft are not the only source of sound under the airspace. Aircraft noise must be compared with background or "ambient" noise, as well as evaluated on an absolute basis. Ambient noise levels in a quiet residential setting are approximately 45 dB DNL (EPA 1974). The vast majority of the airspace ROI consists of rural areas in which noise levels would be below 45 dB DNL. In those areas where military aircraft noise levels would be less than 45 dB DNL_{mr}, military aircraft noise could be noticed but would not add appreciably to overall noise levels. Noise levels in such airspace units are simply listed in Table TU 3.2–4 as "< 45."

Table TU 3.2–4. Noise Environment for Tucson AGS Primary Use Airspace Baseline Conditions and F-35A Beddown Scenarios

Airspace Name[1]	Baseline Conditions			Scenario T1 (24 Aircraft)			Scenario T2 (48 Aircraft)			Scenario T3 (72 Aircraft)		
	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day	DNL_{mr}	CDNL	Booms/ Day
Ruby MOA	53	N/A	N/A	54	N/A	N/A	57	N/A	N/A	58	N/A	N/A
Outlaw MOA	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A
Jackal MOA	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A
Sells MOA	< 45	54	2.3	< 45	49	0.8	45	49	0.7	47	49	0.8
Rustler Airspace	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A	< 45	N/A	N/A
Tombstone MOA	< 45	N/A	N/A	48	N/A	N/A	51	N/A	N/A	53	N/A	N/A
BMGR North TAC Range	61	54	2.3	60	49	0.7	62	48	0.5	64	48	0.5
BMGR South TAC Range	61	54	2.3	60	49	0.7	62	48	0.5	64	48	0.5
VR-263	< 45	N/A	N/A	56	N/A	N/A	59	N/A	N/A	61	N/A	N/A

[1] Noise levels beneath MOAs listed also include noise generated by aircraft operating in overlying ATCAAs; airspace units in which supersonic noise levels are "N/A" are not authorized for supersonic flight.

Sonic boom noise levels were calculated using the BOOMAP program. Under baseline conditions, sonic boom noise levels do not exceed 62 dB DNL under any primary use airspace unit. Beneath BMGR North TAC and South TAC Range airspace and beneath Sells MOA, approximately 2.3 booms are experienced per day under baseline conditions. Supersonic flight is not authorized on MTRs; Ruby, Outlaw, Jackal, or Tombstone MOAs; or Rustler Airspace.

TU 3.2.2.2 Airspace Environmental Consequences

Subsonic noise levels would remain below 45 dB DNL_{mr} beneath Outlaw and Jackal MOAs and Rustler Airspace under all scenarios. Under Scenario T1, noise levels beneath Ruby MOA, Tombstone MOA, and the centerline of VR-263 would increase by 1 dB, 3 dB, and 11 dB, respectively, relative to baseline conditions, and noise levels beneath all other airspace units would remain the same or decrease. Under Scenario T2, subsonic noise levels (DNL_{mr}) would increase by 4 dB beneath Ruby MOA, 6 dB beneath Tombstone MOA, 1 dB beneath BMGR North TAC Range airspace, 1 dB beneath BMGR South TAC Range airspace, and 14 dB beneath the centerline of VR-263. Under Scenario T3, subsonic noise levels (DNL_{mr}) would increase by 5 dB beneath Ruby MOA, 2 dB beneath Sells MOA, 8 dB beneath Tombstone MOA, 3 dB beneath BMGR North and South TAC Range airspace units, and 16 dB beneath the centerline of VR-263. To put these increases in perspective, increases in instantaneous noise levels of 3 to 10 dB are typically described as "noticeable," and increases of greater than 10 dB are typically described as "more than twice as loud."

The increase in subsonic noise level beneath certain primary airspace units can be attributed primarily to the F-35A being louder than other aircraft types currently using the airspace. Noise levels generated by overflight of F-35A aircraft and several other aircraft that use the training airspace frequently are shown in Table TU 3.2–5. For each aircraft type, the table shows SEL and, in parentheses, the SEL_r metric, which adds a decibel 'penalty' to events with fast onset rates that have an increased potential to surprise people. The F-35A also uses higher altitudes, on average, than F-16 aircraft (see Table TU 2.2–3 in Section TU 2.2). In addition, F-35A aircraft based at Tucson AGS are not expected to conduct sortie-operations between 10:00 p.m. and 7:00 a.m., while aircraft currently using the airspace conduct an estimated 1 percent of total sortie-operations during this late-night time period. F-35A noise levels at several altitudes are shown, along with noise levels of other representative users of the airspace, in Table TU 3.2–5.

Table TU 3.2–5. Comparative Aircraft SEL_r Under the Flight Track for Aircraft at Various Vertical Distances (Feet AGL) in Training Airspace

Aircraft	SEL (SEL_r) in dB					Power	Speed (knots)
	500 AGL	1,000 AGL	2,000 AGL	5,000 AGL	10,000 AGL		
F-16[1]	116 (118)	111 (111)	104 (104)	94 (94)	86 (86)	104% NC	350
F-35A[2]	127 (128)	120 (120)	112 (112)	102 (102)	94 (94)	95% ETR	475
A-10	97 (97)	91 (91)	83 (83)	67 (67)	55 (55)	5333 NF	325
F-15	116 (121)	110 (111)	104 (104)	95 (95)	85 (85)	82% NC	550
F/A-18C/D	106 (107)	100 (100)	94 (94)	83 (83)	73 (73)	88% NC	400
T-38	115 (115)	109 (109)	101 (101)	89 (89)	78 (78)	100% RPM	299
Tornado	101 (102)	95 (95)	89 (89)	80 (80)	71 (71)	89% RPM	420
H-60	91 (91)	87 (87)	81 (81)	N/A	N/A	LFO Lite 140 Kts	140
F/A-18 E/F	116 (119)	111 (111)	105 (105)	95 (95)	86 (86)	83% N2	350
F-4C	114 (119)	109 (110)	103 (103)	93 (93)	83 (83)	98% RPM	550

[1] The F-16 engine is GE-100.
[2] The noise levels for the F-35A operating at high speeds were based on an empirical curve fit from the noise data contained in the NoiseFile database for these high-speed operations (Wyle 2010).
Note: Level flight, steady high-speed conditions. Used standard acoustical conditions (59 degrees Fahrenheit and 70 percent relative humidity).
Key: ETR=engine thrust request; N2=engine speed at position 2; NC=core engine speed; NF=fan speed; LFO Lite 140 Kts=helicopter in level flight at 140 knots; RPM=revolutions per minute.

Under baseline conditions and beddown scenarios, aircraft sometimes fly in groups known as "formations." Since SEL is an exposure-based metric, doubling the number of aircraft flying overhead results in a combined SEL that is 3 dB higher than the individual overflights. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL as listed in Table TU 3.2–5.

Most F-35A training time is spent at high altitudes, with approximately 93 percent of total training time occurring above 5,000 AGL (see Chapter 2, Table 2–9). However, when conducting low-altitude training at high engine power settings, F-35A aircraft overflights generate noise levels exceeding 115 dB SEL. As discussed in Appendix B, Section B.2.5.1, studies suggest that individual noise events in excess of 115 dB can trigger a temporary shift in hearing threshold, although the findings of the studies conflict as to the extent of the shift and

whether the shift is to an increased or decreased hearing sensitivity (Ising et al. 1999; West and Green 1994).

Test flight data recorded during multiple low-altitude training flight simulator runs were used to estimate the average number of times per month that a location under the MTR centerline would be exposed to noise levels exceeding 115 dB. From the simulator data, it was found that 80 percent of the total time spent on an MTR was spent at aircraft engine power settings of 50 percent ETR or below, with the remainder of the time spent at higher engine power settings. Approximately 70 percent of total time was spent at altitudes between 500 and 750 feet AGL, with the remaining time being spent at altitudes between 750 and 1,500 feet AGL. A probability-based model, which is described in Appendix B, Section B.3, was used to combine data collected from flight simulator runs with expected MTR frequency of use data. On the narrowest segment of the most frequently used MTR under the scenario with the highest number of MTR sortie-operations (i.e., Scenario T3), an average of 8 overflights per year would exceed 115 dB at a particular point underneath the centerline of the MTR. The average frequency of noise levels exceeding 120 dB (the lower threshold for ear discomfort) would be substantially less. Low-altitude noise events are very brief, with the high noise levels typically lasting less than 4 seconds. NIPTS, otherwise known as hearing loss, typically occurs when loud events are repeated frequently such as occurs in a workplace environment. Infrequent loud events, such as the events that would occur with proposed F-35A low-altitude training, could be highly annoying, but would not be expected to result in NIPTS.

Each MTR includes several segments with defined beginning and ending locations, as well as a defined route corridor width to the right and to the left of the centerline. Studies of MTR operations show that operations are concentrated near the MTR centerline and spend relatively less time near the route corridor edges (Lucas and Plotkin 1988). MTR noise levels stated in this EIS are for a location beneath the MTR centerline in the narrowest segment of the MTR (i.e., the point of highest concentration of overflights). Pilots often enter and exit MTRs at points along the route rather than at the beginning and end points, such that certain MTR segments may experience fewer annual sortie operations than indicated in Table TU 2.2–2.

F-35A training at active-duty Air Force locations would not be expected to take place on the weekend (i.e., Saturday or Sunday). However, mission requirements would dictate the flying schedule. Other weekend flying and ANG weekend training is expected to continue at its current rate.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training. The amplitude of an individual sonic boom is measured by its peak overpressure, in pounds per square foot, and depends on an aircraft's size, weight, geometry, Mach number, and flight altitude. Table TU 3.2–6 shows sonic boom peak overpressures for direct overflight of F-16C, F-15, and F-35A aircraft at Mach 1.2 in straight and level flight at various altitudes as estimated using the program CABOOM (Carlson 1978). F-15 sonic boom overpressure values are shown as a point of reference.

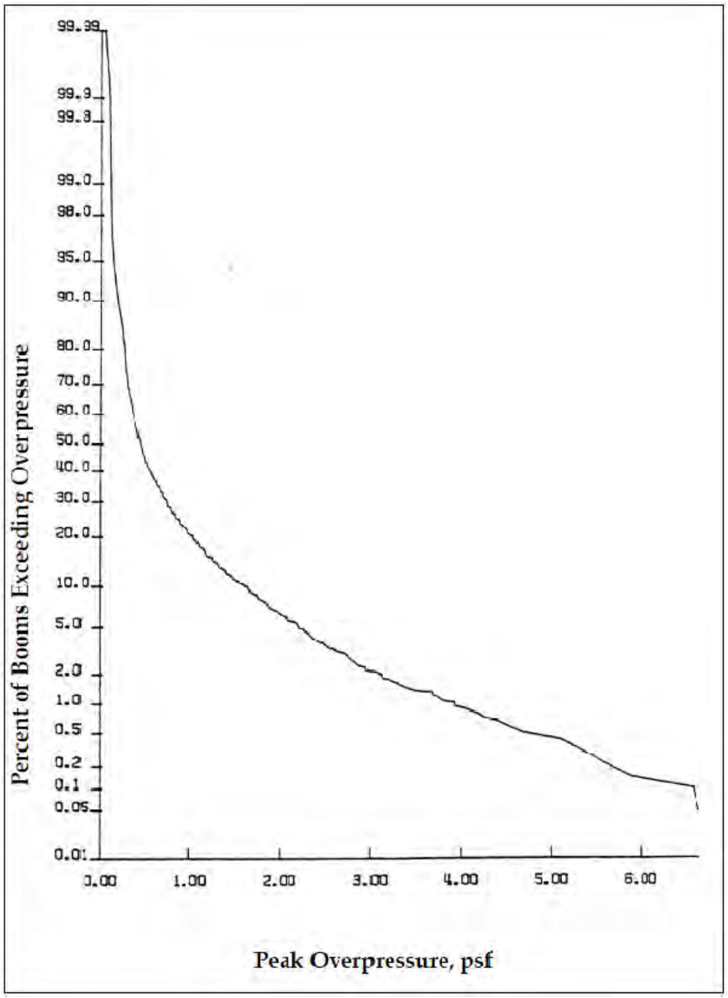
Table TU 3.2–6. Sonic Boom Peak Overpressures (pounds per square foot) for Direct Overflight of F-16 and F-35A Aircraft at Mach 1.2 Level Flight

Aircraft	*Altitude (feet AGL)*		
	10,000	**20,000**	**30,000**
F-16C	4.9	2.5	1.6
F-15	6.4	3.3	2.2
F-35A	5.4	2.9	1.9

Note: Overpressures presented reflect straight and level flight at constant speed; aircraft maneuvers may generate localized "focus booms" with overpressures of 2 to 5 times the magnitude of the steady state sonic booms (Plotkin 1990).
Source: CABOOM (Carlson 1978).

Sonic boom overpressures decrease as the lateral distance from the aircraft flight path increases. Maneuvers can also affect boom amplitude, increasing or decreasing overpressures relative to those shown in Table TU 3.2–6. Research conducted using the ray acoustic theory computer model PCBOOM indicates that fighter aircraft sonic boom focus factors are generally in the range of 2–3 times that generated by steady state flight, while larger supersonic aircraft may generate focus booms up to 5 times more intense than booms generated by steady state flight (Plotkin 1990).

Focus booms affect very limited ground areas such that the frequency of occurrence of high-intensity focus booms is relatively low. A measurement program was conducted to record the occurrence and intensity of sonic booms near the center of a supersonic training airspace unit (Plotkin et al. 1990). Simultaneous with the sonic boom measurements, recordings were made of air combat maneuvers conducted by the F-15 aircraft that were generating the sonic booms. Figure TU 3.2–4 shows the relative occurrence of overpressures of various intensities recorded during air combat maneuvers, including focus booms. F-35A supersonic training is expected to be similar to F-15 and F-16 supersonic training in terms of the time spent at supersonic speeds per sortie, the types of maneuvers conducted, and the Mach numbers used during training. Therefore, the relative occurrence of the intense sonic booms would be expected to be similar to those shown in Figure TU 3.2–4. On average, at a given location near the center of a training airspace unit, approximately 1 percent of the sonic booms experienced would be expected to exceed 4 psf and approximately 0.2 percent would be expected to exceed 6 psf based on the results of the study.



Source: Plotkin et al. 1990.

Figure TU 3.2–4. Cumulative Distribution of Peak Overpressures

F-35A supersonic training is expected to be similar to the F-16 training currently being conducted in the primary use airspace in terms of the time spent at supersonic speeds per sortie, the types of maneuvers conducted, and the Mach numbers used during training. Sonic booms generated by F-35A aircraft would be slightly more intense than sonic booms generated by F-16C aircraft during equivalent flight profiles. The CDNL would remain below 62 dB under all scenarios in all airspace units. The addition of F-35A supersonic operations would be offset by decreased F-16 supersonic operations resulting from drawdown of F-16s at Luke AFB and Tucson AGS. As a result, the CDNL and number of sonic booms per day would decrease under all scenarios beneath all primary training airspace units. Because the frequency and intensity of F-35A sonic booms are expected to be similar to the frequency and intensity of F-16 sonic booms, supersonic noise levels would not increase under the beddown scenarios, although subsonic noise levels would increase. If a person feels that his or her property has been damaged by sonic booms caused by aircraft based at Tucson AGS, he or she should contact the Tucson AGS Public Affairs Office to initiate a claim. As stated in Section TU 3.2.1, F-35A subsonic noise is not expected to cause damage to structures. Additional discussions on the risk

of damage to structures caused by subsonic aircraft noise can be found in Section TU 3.9, Cultural Resources.

As described in Section TU 2.2.2, F-35A aircraft would conduct training with inert and live munitions at BMGR. BMGR includes several munitions impact areas approved for live munitions training. The computer program BNOISE2 was used to model noise associated with current and proposed munitions training as if all F-35A munitions training were conducted at the BMGR impact area located closest to the BMGR boundary. Furthermore, no reductions in current munitions usage were made to account for drawdown of F-16 aircraft scheduled to occur concurrently with the F-35A beddown. Using these extremely conservative noise modeling assumptions, modeled noise levels exceeding 62 dB CDNL would not extend beyond the boundaries of DoD-owned land under any beddown scenarios. F-35A munitions training noise may be audible at off-range locations, but would occur relatively infrequently.

Auxiliary Airfield

Libby AAF. Under all Tucson AGS beddown scenarios, Libby AAF would be used for practice approaches by F-35A aircraft. Noise contours at Libby AAF under Scenarios T1, T2, and T3 are shown in Figures TU 3.2–5, TU 3.2–6, and TU 3.2–7, respectively, overlaid on baseline noise contours. All noise contours under all scenarios are contained entirely within the boundaries of Fort Huachuca and Sierra Vista Municipal Airport. The off-installation area affected by noise levels greater than 65 dB DNL would increase by approximately 32 acres under each of the scenarios relative to baseline conditions (see Table TU 3.2–7). These 32 acres are owned by the Sierra Vista Municipal Airport. The amount of on-installation land would increase by 820 acres under Scenario T1, 1,731 acres under Scenario T2, and 2,886 acres under Scenario T3. No off-installation residents would be exposed to noise levels greater than 80 dB DNL under any scenario, and the risk of hearing loss for persons residing off the installation would be minimal. Hearing loss risk among DoD employees on Fort Huachuca would be evaluated using the appropriate DoD component regulations for occupational noise exposure, and hearing loss risk among employees of the Sierra Vista Municipal Airport would be covered by OSHA and NIOSH occupational hearing loss regulations. No residences exist within the part of Fort Huachuca affected by the expanded noise contours.

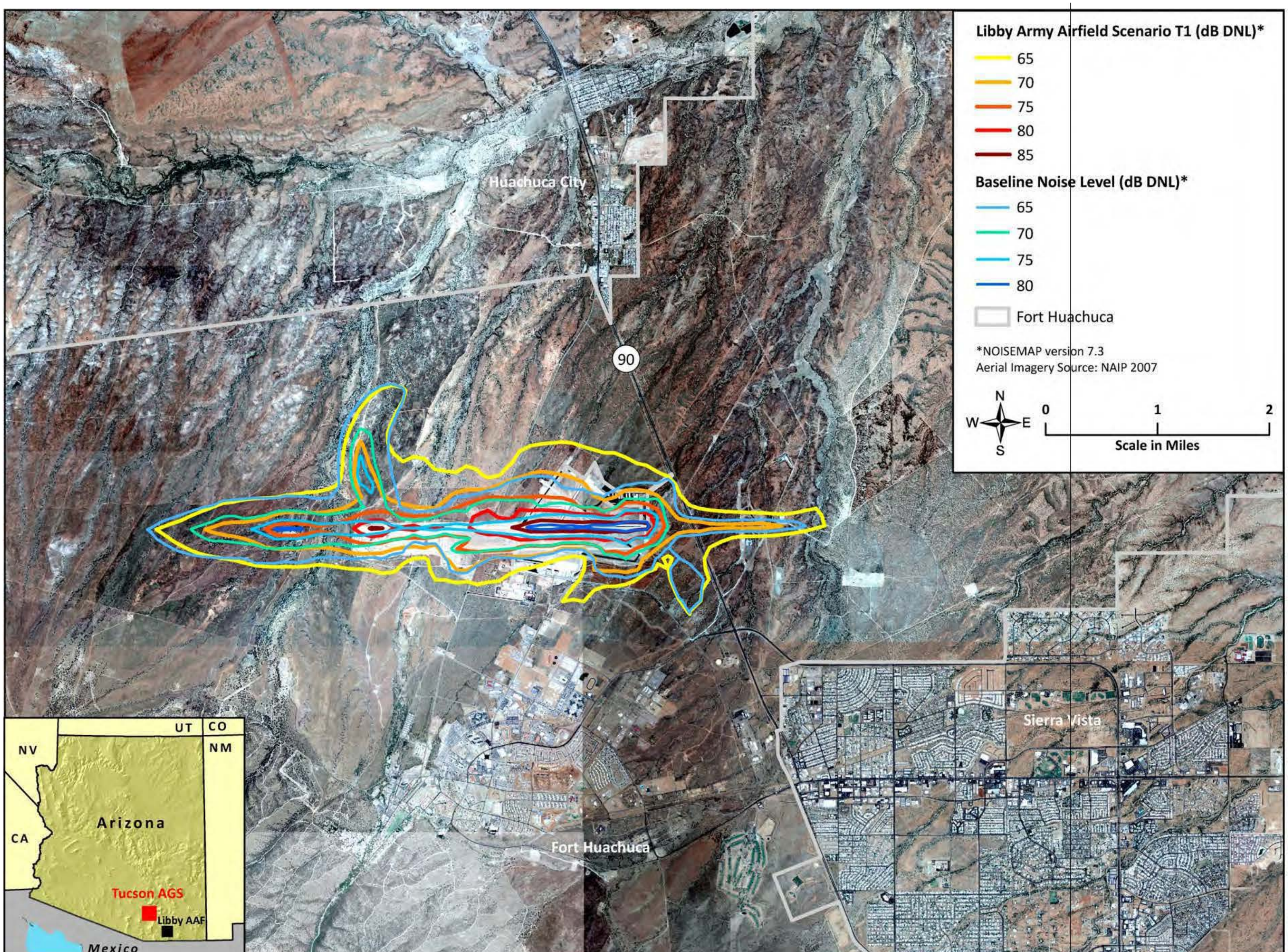


Figure TU 3.2–5. Scenario T1 and Baseline Noise Contours at Libby AAF

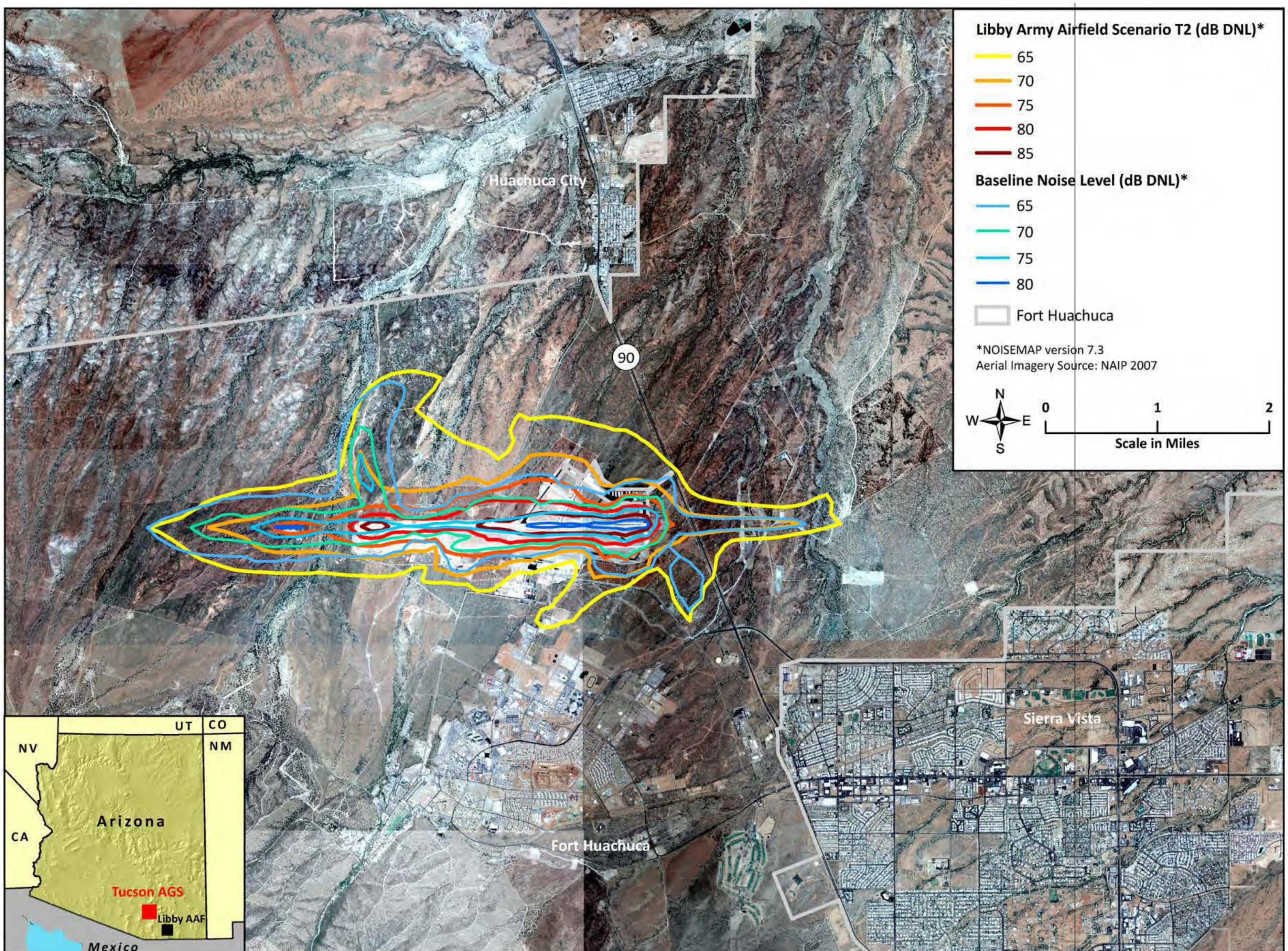


Figure TU 3.2–6. Scenario T2 and Baseline Noise Contours at Libby AAF

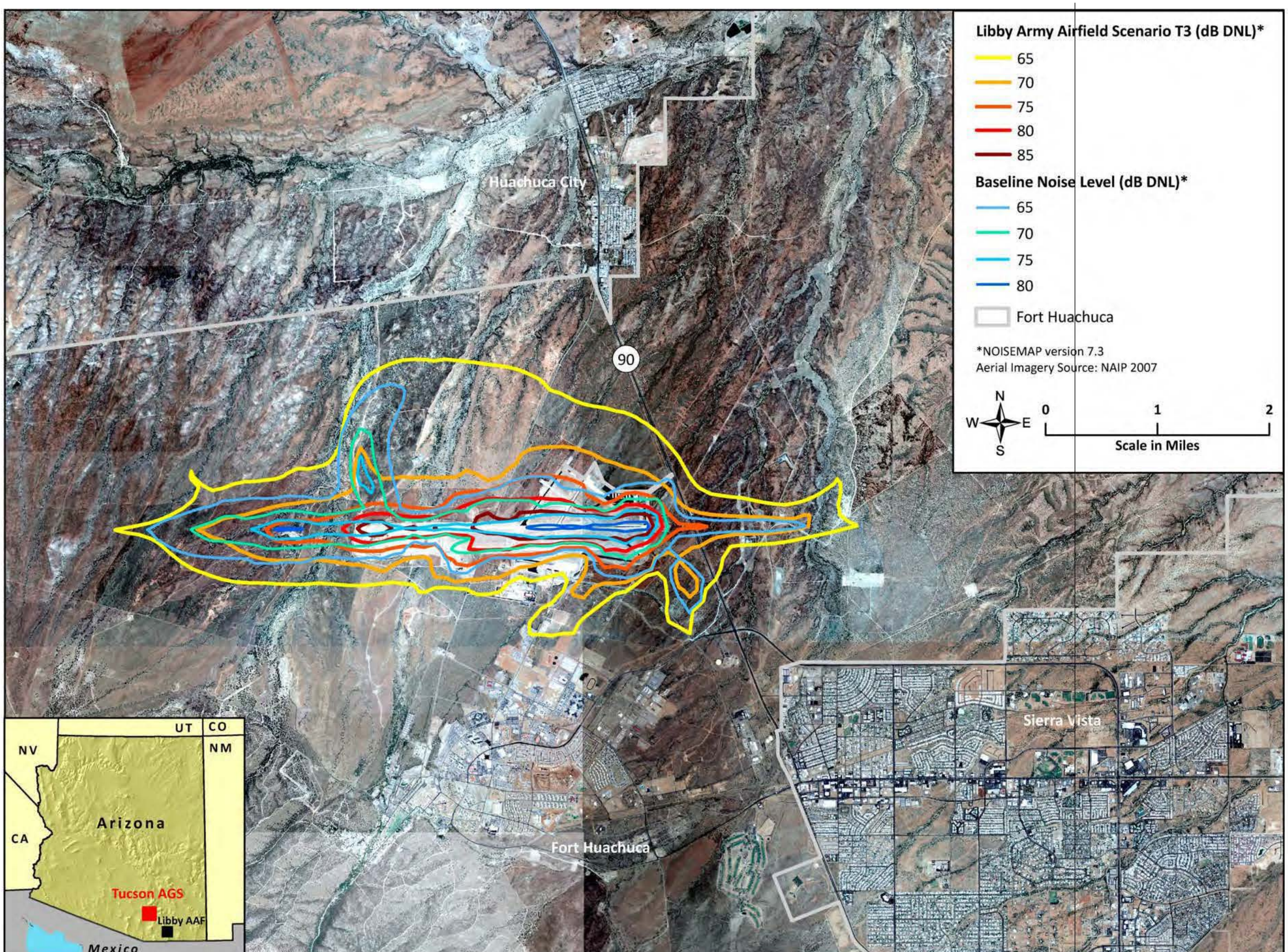


Figure TU 3.2–7. Scenario T3 and Baseline Noise Contours at Libby AAF

Table TU 3.2–7. Population and Acreage Under Noise Contours Near Libby AAF, Baseline Conditions and F-35A Beddown Scenarios

Contour Interval (dB DNL)	*Population Affected (Off-Installation/Airport)*		*Total Area Affected (Off-Installation but on Airport)*		*Total Area Affected (On-Installation)*	
	Number	**Change**	**Acres**	**Change**	**Acres**	**Change**
Baseline Conditions						
Total ≥ 65	**0**	**N/A**	**41**	**N/A**	**2,038**	**N/A**
65–69	0	N/A	25	N/A	1,108	N/A
70–74	0	N/A	12	N/A	632	N/A
75–79	0	N/A	4	N/A	266	N/A
80–84	0	N/A	0	N/A	32	N/A
≥ 85	0	N/A	0	N/A	0	N/A
Scenario T1 (24 Aircraft)						
Total ≥ 65	**0**	**N/A**	**72**	**31**	**2,858**	**820**
65–69	0	N/A	38	13	1,539	431
70–74	0	N/A	24	12	674	42
75–79	0	N/A	7	3	396	130
80–84	0	N/A	3	3	187	155
≥ 85	0	N/A	0	0	62	62
Scenario T2 (48 Aircraft)						
Total ≥ 65	**0**	**N/A**	**73**	**32**	**3,769**	**1,731**
65–69	0	N/A	9	(16)	2,097	989
70–74	0	N/A	45	33	825	193
75–79	0	N/A	14	10	417	151
80–84	0	N/A	4	4	285	253
≥ 85	0	N/A	1	1	145	145
Scenario T3 (72 Aircraft)						
Total ≥ 65	**0**	**N/A**	**73**	**32**	**4,924**	**2,886**
65–69	0	N/A	1	(24)	2,758	1,650
70–74	0	N/A	44	32	1,118	486
75–79	0	N/A	21	17	496	230
80–84	0	N/A	4	4	338	306
≥ 85	0	N/A	3	3	214	214

Note: (Number) denotes a negative number.

TU 3.3 Air Quality

TU 3.3.1 Base

TU 3.3.1.1 Base Affected Environment

Air quality at a given location can be described by the concentrations of various air pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing its concentration to an appropriate Federal and/or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The U.S. Environmental Protection Agency (EPA) established the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. Units of concentration for these standards are generally expressed in parts per million or micrograms per cubic meter. The Arizona Department of Environmental Quality (ADEQ) has adopted standards that are the same as the NAAQS. Table 3–3 in Chapter 3, Section 3.3, presents the NAAQS.

Region of Influence

Air emissions produced from construction and operation of the beddown of F-35A aircraft at Tucson AGS would mainly affect air quality within Pima County. Proposed aircraft operations also would affect air quality within training areas associated with Tucson AGS and aircraft flight routes between these locations. Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as CO and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as O_3 may extend much farther downwind than for inert pollutants. O_3 is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. O_3 precursors are mainly nitrogen oxides (NO_X) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O_3 levels usually occurs several hours after they are emitted and many miles from their source.

Existing Air Quality

The EPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area generally is in nonattainment for a pollutant if the applicable NAAQS has been exceeded more than once per year. Former nonattainment areas that have attained the NAAQS are designated as maintenance areas. Currently, Pima County is in attainment of the NAAQS for all pollutants.

In the past, Pima County did not attain the NAAQS for CO. Due to a reduction in emissions caused by Federal emission standards for new vehicles and a state vehicle emissions testing program, the region was redesignated as in attainment for the CO standards on April 25, 2000. In the same year, the EPA approved the first Limited Maintenance Plan (EPA 2000). On

October 14, 2009, the EPA approved the second 10-year CO Limited Maintenance Plan, extending the Vehicle Emission Inspection Program until 2016 (EPA 2009a).

Regional Air Emissions. Tucson AGS is located in Pima County; Table TU 3.3–1 summarizes the annual emissions generated by this region in 2008 (EPA 2011). The majority of emissions within the region occur from (1) on-road and nonroad mobile sources (VOCs, CO, and NO_X), (2) solvent/surface coating usages (VOCs), and (3) fugitive dust (PM_{10}/$PM_{2.5}$).

Table TU 3.3–1. Annual Emissions for Pima County, Arizona, Calendar Year 2008

Source Type	*Air Pollutant Emissions (tons per year)*					
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Stationary Sources	16,211	14,717	5,954	4,305	25,923	6,092
Mobile Sources	17,300	154,827	19,971	256	908	699
Total	**33,510**	**169,545**	**25,925**	**4,561**	**26,831**	**6,791**

Source: EPA 2011.

Tucson AGS Emissions. Table TU 3.3–2 presents an estimation of annual operational emissions associated with the current basing of 65 F-16 aircraft at Tucson AGS. Existing sources that would be affected by the beddown of F-35A at Tucson AGS include (1) operations and engine maintenance/testing of F-16 aircraft, (2) onsite personally and government-owned vehicles (POVs and GOVs), (3) offsite POV commutes, (4) aerospace ground equipment (AGE), (5) nonroad mobile equipment, and (6) stationary and other sources. Emissions associated with existing F-16 aircraft operations were obtained from the *Final 2008 Air Emissions Inventory Report 162 FW Arizona ANG – Tucson, Arizona* (Arizona ANG 2010a). In addition, emissions from offsite staff commuter vehicles were estimated with the use of (1) average one-way trip lengths (16.7 miles) developed from data found in the Pima Association of Governments (PAG) 2007 regional commuter survey completed by Tucson AGS (Tucson AGS 2007) and (2) the EPA MOBILE6.2 model input files developed for the Tucson region by the PAG (PAG 2010).

Table TU 3.3–2. Annual Emissions from Current F-16 Operations at Tucson AGS, Year 2009 Base Case

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
F-16 Aircraft Operations	51.67	198.55	65.21	10.96	4.71	4.71	34,151
Onsite GOVs/POVs	0.47	3.08	1.21	0.10	0.04	0.04	3,625
Offsite GOVs/POVs	5.35	73.64	5.95	0.09	0.25	0.24	4,493
AGE	1.07	8.32	6.54	4.09	0.64	0.59	1,436
Nonroad Vehicles	0.38	15.06	0.99	0.03	0.08	0.07	1,161
Stationary Sources	8.67	8.31	6.76	0.69	1.61	1.48	243
Total Existing Emissions	**67.61**	**306.96**	**86.66**	**15.96**	**7.33**	**7.13**	**45,109**

Key: CO_{2e}=carbon dioxide equivalent.
Source: Arizona ANG 2010a.

Regional Climate

Meteorological data collected at the Tucson Airport are used to describe the climate of the Tucson AGS project area (WRCC 2007a, 2007b, 2010).

Temperature. Pima County is known for extreme heat in the summer months and mild conditions during the winter. The average high and low temperatures during the summer months at Tucson AGS range from about 99 degrees Fahrenheit (°F) to 71 °F. The average high and low temperatures during the winter months range from 66 °F to 40 °F to (WRCC 2010).

Precipitation. Average annual precipitation for Tucson AGS is 11.5 inches. Annual precipitation in the region peaks in the summer months (July through September) due to monsoonal flow. The peak monthly average rainfall of 2.34 inches occurs in July. Spring is the driest season, as the lowest monthly average of 0.28 inches occurs in June. Snowfalls in the region are rare and minimal (WRCC 2010).

Prevailing Winds. The annual average wind speed at Tucson AGS is 7.6 miles per hour. April through July experience the strongest winds, with a monthly average speed of 7.5 miles per hour during this period. The prevailing wind direction is from the southeast.

Applicable Regulations and Standards

Federal Regulations. Because the project region within Pima County includes a maintenance area for the Federal CO standard, the requirements of the EPA General Conformity Rule are applicable to CO emissions that would occur from the beddown of F-35A aircraft within this area. The applicable conformity *de minimis* threshold for this area is 100 tons per year of CO. If emissions from the F-35A beddown scenarios exceed this conformity threshold, the Air Force must demonstrate that these emissions would conform to the State Implementation Plan through application of one or more of the criteria for determining conformity of general Federal actions prescribed in Title 40 of the *Code of Federal Regulations* (CFR), Section 93.158, under the procedures prescribed in 40 CFR, Section 93.159, and Title 17 of the *Pima County Code*, Section 17.12.140(B)(1) (Pima County 2010).

<u>Requirements for Class I Areas.</u> As part of the Prevention of Significant Deterioration (PSD) Regulation, the Federal Clean Air Act provides special protection for air quality and air-quality-related values (including visibility and pollutant deposition) in selected areas of the United States (national parks greater than 6,000 acres or national wilderness areas greater than 5,000 acres). These Class I areas are areas where any appreciable deterioration of air quality is considered significant. In 1999, the EPA promulgated a regional haze regulation that requires states to establish goals and emission reduction strategies to make initial improvements in visibility within their respective Class I areas (EPA 1999). Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. The closest Class I area to Tucson AGS is the Saguaro Wilderness Area, whose nearest border is about 12 miles to the east-northeast. Criteria to determine the significance of air quality impacts within Class I areas usually pertain to stationary emission sources, as mobile sources are generally exempt from permit review by regulatory agencies. However, Section 169A of the Clean Air Act states the Federal goal of prevention of any future impairment of visibility within Class I areas from manmade sources of air pollution. Therefore, due to the proximity of the Saguaro Wilderness Area to Tucson AGS, this EIS provides a qualitative analysis of the potential for emissions to affect visibility within this pristine Class I area.

State Regulations. ADEQ is responsible for enforcing air pollution regulations. However, the Pima County Department of Environmental Quality (PDEQ) regulates air quality in Pima County.

Several states have promulgated laws as a means of reducing statewide levels of greenhouse gas emissions. The State of Arizona has developed the Climate Change Action Plan for this purpose (Climate Change Advisory Group 2006). Groups of states, such as the Western Climate Initiative (with Arizona as a founding member), also have formed regionally based collectives to jointly address greenhouse gas pollutants.

Local Regulations. PDEQ enforces the NAAQS by developing rules to regulate and permit stationary sources of air emissions. PDEQ air quality regulations are found in Title 17 of the *Pima County Code,* "Air Quality Control" (Pima County 2010).

As part of the attainment planning processes in Pima County, PDEQ and the PAG have developed the *2008 Revision to the Carbon Monoxide Limited Maintenance Plan for the Tucson Air Planning Area (for 2010)* (PAG 2008). The Federal Motor Vehicle Control Program, a state inspection and maintenance program, and a state oxyfuels program have been implemented to control CO emissions in Pima County.

TU 3.3.1.2 Base Environmental Consequences

Air quality impacts from the F-35A beddown at Tucson AGS were reviewed in light of Federal, state, and local air pollution standards and regulations. For the purposes of this analysis, if project emissions exceeded a threshold requiring a conformity determination in the Pima County project region (e.g., 100 tons per year of CO), further analysis was conducted to determine whether impacts would be significant. In such cases, if emissions conform to the approved State Implementation Plan, impacts would be less than significant. In the case of criteria pollutants for which the Pima County project region is in attainment of an NAAQS (O_3, NO_2, SO_2, PM_{10}, and $PM_{2.5}$), the analysis used the PSD threshold for new major sources of 250 tons per year as an indicator of the significance or insignificance of projected air quality impacts.

Construction

The beddown of F-35A aircraft at Tucson AGS would require construction and/or renovation of airfield facilities to accommodate the basing decision, including training facilities, hangars, taxiways, and maintenance and fueling facilities. Air quality impacts from construction activities would result from (1) combustive emissions due to the use of fossil-fuel-powered equipment and (2) fugitive dust emissions (PM_{10}/$PM_{2.5}$) due to the operation of equipment on exposed soil. Construction activity data developed by Air Force staff were used to estimate projected construction equipment usages and associated combustive and fugitive dust emissions (Air Force 2010).

Factors needed to derive construction source emission rates were obtained from *Compilation of Air Pollutant Emission Factors, AP-42, Volume I* (EPA 1995); the EPA NONROAD Model for nonroad construction equipment (EPA 2009b); and the MOBILE6.2 Model for on-road vehicles (EPA 2003).

The analysis reduced fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels to simulate implementation of Best Management Practices (BMPs) for fugitive dust control. Chapter 3, Section 3.3, of this EIS lists these BMPs.

Table TU 3.3–3 presents estimates of emissions from construction activities that would occur under Scenario T3 at Tucson AGS. These data show that, if all construction activities occurred in 1 year, total CO emissions would be well below the conformity *de minimis* thresholds. Pima County is in attainment of the NAAQS for O_3, NO_2, SO_2, PM_{10}, and $PM_{2.5}$, and conformity *de minimis* thresholds do not apply for these pollutants or their precursors. When compared with the PSD thresholds used to indicate significance or nonsignificance, the construction emissions fall well below these indicators. Therefore, temporary construction emission impacts on regional air quality are not expected to be significant. The main sources of PM_{10}/$PM_{2.5}$ emissions would occur as fugitive dust from the operation of equipment on unpaved surfaces.

Table TU 3.3–3. Scenario T3 Total Construction Emissions

Construction Activity	*Air Pollutant Emissions (tons)*						
	VOCs	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Squadron Operations (3rd Squadron)	0.04	0.23	0.41	0.01	0.31	0.06	60.0
Aircraft Maintenance Unit (AMU)	0.02	0.09	0.16	0.00	0.29	0.04	23.3
Academic Training Center (3rd Squadron)	0.12	0.60	0.97	0.02	0.13	0.10	126.0
Operational Training Facility (Classrooms – FTD)	0.02	0.09	0.14	0.00	0.02	0.02	18.6
Maintenance Hangars (2 bay)	0.01	0.06	0.10	0.00	0.01	0.01	13.5
Hangar Upgrades	0.03	0.14	0.23	0.01	0.03	0.02	29.4
Battery Maintenance	0.00	0.00	0.01	0.00	0.00	0.00	0.9
Ejection Seat Maintenance	0.00	0.02	0.03	0.00	0.00	0.00	3.5
Flightline Maintenance Facility	0.00	0.01	0.02	0.00	0.00	0.00	3.0
Engine Maintenance	0.00	0.01	0.01	0.00	0.00	0.00	1.2
Corrosion Control (2 bay CRF)	0.01	0.06	0.10	0.00	0.01	0.01	13.5
Gun System Maintenance	0.00	0.02	0.03	0.00	0.00	0.00	3.4
Support (AGE) Maintenance Facility	0.01	0.06	0.09	0.00	0.01	0.01	12.4
AGE Storage Area	0.01	0.05	0.08	0.00	0.01	0.01	10.1
Interim Simulator Facility	0.02	0.09	0.14	0.00	0.02	0.01	18.0
Interim Moves and Relocations	0.06	0.32	0.51	0.01	0.07	0.05	66.0
Bulk Fuel Storage	0.00	0.02	0.02	0.00	0.01	0.00	3.2
Communications Security Space	0.00	0.01	0.01	0.00	0.00	0.00	1.2
Electrical Infrastructure	0.01	0.04	0.07	0.00	0.01	0.01	8.7
Apron Re-Stripe	0.00	0.01	0.01	0.00	0.00	0.00	1.1
Taxiway - Asphalt Removal	0.06	0.32	0.56	0.01	0.08	0.05	79.0
Taxiway - Pour Concrete	0.05	0.20	0.59	0.01	0.03	0.03	103.2
Parking Apron - Asphalt Removal	0.00	0.02	0.03	0.00	0.00	0.00	4.0
Parking Apron - Pour Concrete	0.00	0.01	0.03	0.00	0.00	0.00	5.3
Total Emissions[1]	**0.48**	**2.48**	**4.34**	**0.10**	**1.04**	**0.43**	**608.5**
Pima County Conformity and PSD Thresholds	**250**	**100**	**250**	**250**	**250**	**250**	**N/A**

[1] All emissions are assumed to occur in calendar year 2012.

Key: CRF=Composite Repair Facility; FTD=Field Training Detachment.

Operations

The operational air quality impact analysis for the F-35A beddown scenarios at Tucson AGS is based upon the net change in emissions resulting from the replacement of existing F-16 operations with F-35A operations. The F-16 scenario starting point for the base case period for comparison to F-35A operations is year 2009. Therefore, the net change in annual operational emissions associated with the beddown of F-35A aircraft at Tucson AGS is equal to emissions from the F-35A action for a given year, minus emissions from F-16 operations replaced at that time.

Sources associated with the beddown of F-35A aircraft at Tucson AGS would include (1) operations and engine maintenance/testing of F-35A aircraft, (2) onsite POVs and GOVs, (3) offsite POV commutes, (4) AGE, (5) nonroad mobile equipment, and (6) stationary and other sources. Operational data used to calculate projected F-35A aircraft emissions at Tucson AGS were obtained from data used in the project noise analyses (see Section TU 3.2).

Emissions from projected onsite POV/GOV, nonroad, and stationary sources were estimated by multiplying emissions from 2009 base case operations by the ratio of the projected F-35A and actual 2009 F-16 aircraft numbers at Tucson AGS. Emission estimates for onsite POV/GOV and nonroad sources also took into consideration MOBILE6.2 and NONROAD model emission factors, respectively, for the 2009 base case and future year scenarios. Emissions from projected offsite POV commuting activities were estimated by multiplying the vehicle miles traveled in 2009 associated with F-16 operations by the ratio of the projected F-35A and actual 2009 Tucson AGS (Air National Guard only) basing populations and then multiplying by future year MOBILE6.2 emission factors. Lastly, emissions from projected AGE usages are based upon legacy AGE usages for F-16 aircraft and new AGE usages projected for the F-35A aircraft.

Tables TU 3.3–4, TU 3.3–5, and TU 3.3–6 summarize the annual emissions that would occur under Scenarios T1, T2, and T3, respectively, from the potential build-out of 24 to 72 F-35A aircraft at Tucson AGS. These data show that the addition of 24 F-35A aircraft under Scenario T1 would result in a net reduction of all criteria pollutant emissions. The addition of 48 and 72 F-35A aircraft under Scenarios T2 and T3 would result in net reductions of all criteria pollutant emissions, except that Scenario T2 would produce a nominal increase in emissions of NO_X and Scenario T3 would produce further increases of emissions of NO_X. None of these emission increases from these actions would exceed the applicable CO conformity or National Environmental Policy Act (NEPA) significance thresholds. Therefore, the actions would produce less than significant air quality impacts. The main contributors to the projected emission increases would include F-35A aircraft operations and POVs that commute to and from Tucson AGS.

Table TU 3.3–4. Scenario T1 Annual Operational Emissions

Activity	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	1.13	47.58	36.89	4.31	0.37	0.37	14,081
Onsite POVs/GOVs	0.16	1.19	0.36	0.05	0.02	0.02	1,925
Offsite POVs	1.72	29.48	1.70	0.05	0.09	0.09	2,148
Nonroad	0.12	4.42	0.31	0.01	0.02	0.02	436
Point and Area Sources	0.12	3.12	2.54	0.26	0.60	0.55	91
F-16 Operations – All Sources	18.35	80.01	23.40	4.49	2.04	1.98	9,666
Total Projected Emissions – Scenario T1	**21.60**	**165.80**	**65.20**	**9.17**	**3.14**	**3.03**	**28,347**
Year 2009 Base Case Emissions	**67.61**	**306.95**	**86.67**	**15.96**	**7.32**	**7.14**	**45,109**
Scenario T1 Minus Base Case Emissions	**(46.01)**	**(141.14)**	**(21.48)**	**(6.79)**	**(4.17)**	**(4.10)**	**(16,762)**
Pima County Conformity and PSD Thresholds	**250**	**100**	**250**	**250**	**250**	**250**	**N/A**

Note: (Number) denotes a negative number.

Table TU 3.3–5. Scenario T2 Annual Operational Emissions

Activity	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	2.26	95.17	73.79	8.63	0.75	0.75	28,163
Onsite POVs/GOVs	0.30	2.31	0.64	0.11	0.04	0.04	3,874
Offsite POVs	3.18	57.14	3.01	0.10	0.19	0.17	4,322
Nonroad	0.21	8.03	0.58	0.02	0.04	0.04	871
Point and Area Sources	6.50	6.23	5.07	0.52	1.20	1.11	182
F-16 Operations – All Sources	6.07	26.23	7.73	1.50	0.68	0.66	3,222
Total Projected Emissions – Scenario T2	**18.52**	**195.11**	**90.82**	**10.88**	**2.90**	**2.77**	**40,634**
Year 2009 Base Case Emissions	**67.61**	**306.95**	**86.67**	**15.96**	**7.32**	**7.14**	**45,109**
Scenario T2 Minus Base Case Emissions	**(49.08)**	**(111.84)**	**4.15**	**(5.09)**	**(4.41)**	**(4.36)**	**(4,475)**
Pima County Conformity and PSD Thresholds	**250**	**100**	**250**	**250**	**250**	**250**	**N/A**

Note: (Number) denotes a negative number.

Table TU 3.3–6. Scenario T3 Annual Operational Emissions

Activity	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_{2e}
F-35A Operations and AGE	3.40	142.76	110.69	12.94	1.12	1.12	42,247
Onsite POVs/GOVs	0.32	2.55	0.65	0.12	0.05	0.05	4,450
Offsite POVs	3.38	63.58	3.04	0.11	0.22	0.20	4,965
Nonroad	0.29	10.82	0.81	0.03	0.06	0.06	1,307
Point and Area Sources	9.75	9.35	7.61	0.78	1.81	1.66	273
F-16 Operations – All Sources	6.07	26.23	7.73	1.50	0.68	0.66	3,222
Total Projected Emissions – Scenario T3	**23.21**	**255.29**	**130.53**	**15.48**	**3.94**	**3.75**	**56,464**
Year 2009 Base Case Emissions	**67.61**	**306.95**	**86.67**	**15.96**	**7.32**	**7.14**	**45,109**
Scenario T3 Minus Base Case Emissions	**(44.40)**	**(51.65)**	**43.86**	**(0.48)**	**(3.38)**	**(3.39)**	**11,356**
Pima County Conformity and PSD Thresholds	**250**	**100**	**250**	**250**	**250**	**250**	**N/A**

Note: (Number) denotes a negative number.

Due to the presence of pristine Class I areas within the project region, F-35A emissions that occur within the Tucson AGS project region have the potential to impair visibility within these areas. The Class I area of most concern is the Saguaro Wilderness Area, whose nearest border is about 12 miles to the east-northeast of Tucson AGS. All other Class I areas in the project region occur at such a great distance from Tucson AGS that they would experience inconsequential air quality impacts from projected F-35A operations at Tucson AGS. Visibility impairment could occur from projected primary emissions of NO_2, SO_2, and PM_{10} or secondary formation of visibility-reducing particulate matter in the atmosphere due to precursor emissions of VOCs, NO_2, or SO_2. Visibility impairment from primary NO_2 emissions could occur as a brown-colored haze in the lower layer of the atmosphere. This situation usually would occur during the colder months of the year, when a lack of sunlight prevents the conversion of this pollutant to nitric oxide and oxygen. Visibility impairment due to primary PM_{10} emissions would occur in the form of plume blight or atmospheric discoloration from contrails. Visibility impairment due to the secondary formation of nitrate or sulfate particulates in the atmosphere due to emissions of NO_X or SO_2 usually would occur in the warmer months of the year. This effect would take the form of regional haze, which would reduce regional visual range.

The data in Table TU 3.3–6 show that Scenario T3, the maximum basing and emissions scenario of 72 F-35A aircraft, would increase NO_X emissions by 43.9 tons per year within the Tucson AGS project region. During periods when winds would transport emissions from Tucson AGS to the Saguaro Wilderness Area, the dispersion associated with such a great travel distance would substantially dilute their concentrations upon arrival in this pristine area. As a result, F-35A operations within the Tucson AGS project region would not substantially contribute to visibility impairment within the Saguaro Wilderness Area. Therefore, F-35A operations within the Tucson AGS project region would produce less than significant contributions to visibility impairment within nearby Class I areas.

In addition to presenting estimates of greenhouse gas emissions that would occur under the F-35A beddown scenarios at Tucson AGS, the following considers how climate change could impact the F-35A beddown scenarios at Tucson AGS and what adaptation strategies, if any, would be required to respond to these future conditions. For Tucson AGS, the main effect of climate change to consider is increased aridity, as documented in *Global Climate Change Impacts in the United States* (USGCRP 2009). This report predicts that in the future, the southwest will experience increased droughts, temperatures, wildfires, and scarcities of water supplies. Operations at Tucson AGS have adapted to droughts, high temperatures, and scarce water supplies. However, exacerbation of these conditions in the future would increase the cost of proposed operations at Tucson AGS and would impede operations during extreme events. Additional measures would be needed to mitigate these occurrences. Since brush and grassland plant communities border Tucson AGS and Libby AAF, an increase in wildfires in the region could interrupt proposed operations and could cause smoke obscurations from these events. Therefore, additional measures would be needed to protect infrastructure and personnel from increased wildfires.

TU 3.3.2 Airspace

TU 3.3.2.1 Airspace Affected Environment

Projected F-35A aircraft operations within auxiliary airfields, training areas, and aircraft flight routes between these locations and Tucson AGS would affect air quality within portions of southern Arizona and southwestern New Mexico. Most of the regions below and adjacent to these airspace units currently attain all of the NAAQS. Areas that do not attain an NAAQS or are maintenance areas for these standards include the (1) Ajo SO_2 maintenance area, (2) Ajo PM_{10} moderate nonattainment area, (3) Douglas SO_2 maintenance area, (4) Paul Spur/Douglas Planning Area PM_{10} moderate nonattainment area, (5) San Manuel SO_2 maintenance area, (6) Hayden SO_2 nonattainment area, (7) Hayden Planning Area PM_{10} moderate nonattainment area, (8) Miami SO_2 maintenance area, and (9) Miami Planning Area PM_{10} moderate nonattainment area.

Several of the airspace units and MTRs projected for use by the F-35A aircraft also are in close proximity or overlie pristine Class I areas, including the (1) Saguaro Wilderness Area, (2) Galiuro Wilderness Area, (3) Chiricahua Wilderness Area, (4) Chiricahua National Monument Wilderness Area, (5) Superstition Wilderness Area, (6) Sierra Ancha Wilderness Area, (7) Mount Baldy Wilderness Area, and (8) Gila Wilderness Area. Therefore, due to the proximity of these pristine areas to projected aircraft operations, this EIS provides a qualitative analysis of the potential for projected emissions to affect visibility within these areas.

Table TU 3.3–7 presents an estimation of annual emissions due to F-16 aircraft operations within the Tucson AGS airspace units during the base case year of 2009. Since existing F-16 aircraft operations within the Ruby, Outlaw, and Sells MOAs/ATCAAs and the Rustler Airspace occur at least 3,000 feet AGL, no emissions are presented for these airspace units. F-35A operations and associated emissions would replace most of the existing F-16 aircraft operations and associated emissions within these areas.

Table TU 3.3–7. Annual Emissions from F-16 Operations within Tucson AGS Airspace Units, 2009 Base Case

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_{2e}
Jackal MOA/ATCAA	2.82	1.06	35.94	1.17	1.24	1.24	3,926
Tombstone MOA/ATCAA	4.53	1.69	57.60	1.87	1.99	1.99	6,294
R-2301E (BMGR East)	9.24	3.46	117.58	3.82	4.06	4.06	12,847
VR-263	1.59	0.59	20.23	0.66	0.70	0.70	2,210
Libby AAF	5.67	3.91	26.31	1.35	1.41	1.41	4,543
Total Existing Emissions	**23.85**	**10.71**	**257.66**	**8.87**	**9.40**	**9.40**	**29,820**
F-16 Future Reductions – Scenario T1[1]	**(17.89)**	**(7.82)**	**(198.39)**	**(6.76)**	**(7.17)**	**(7.17)**	**(22,737)**
F-16 Future Reductions – Scenarios T2/T3[1]	**(20.87)**	**(9.43)**	**(223.77)**	**(7.72)**	**(8.18)**	**(8.18)**	**(25,966)**

[1] Equal to F-16 airspace emissions eliminated under each F-35A scenario.
Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL; (Number) denotes a negative number.

TU 3.3.2.2 Airspace Environmental Consequences

Most of the regions below and adjacent to airspace units proposed for use by the F-35A aircraft in southern Arizona and southwestern New Mexico currently attain all of the NAAQS. However, there are several areas in this region that are in maintenance or moderate nonattainment of an NAAQS. Airspace units where F-35A aircraft would operate below 3,000 feet AGL and, therefore, directly affect these areas include (1) the eastern portion of R-2301E, which extends into the Ajo PM_{10} nonattainment and SO_2 maintenance areas, and (2) Tombstone MOA, which overlies the Paul Spur/Douglas Planning Area PM_{10} moderate nonattainment and Douglas SO_2 maintenance areas. For the purposes of this analysis, if projected emissions within any airspace unit were estimated to remain below a conformity threshold for a moderate SO_2 or PM_{10} nonattainment area (100 tons per year of these pollutants), these emissions would produce less than significant impacts. For criteria pollutants for which the airspace units are in attainment of an NAAQS (O_3, CO, NO_2, and $PM_{2.5}$), the analysis used the PSD threshold for new major sources of 250 tons per year as an indicator of significance or insignificance of projected air quality impacts. If projected emissions exceed one of these levels, further analyses were conducted to determine whether impacts were significant. The analysis also evaluated how projected emissions would affect air quality within Federal Class I areas that are adjacent to airspace units.

Operations

The air quality impact analysis of F-35A aircraft operations within Tucson AGS airspace units is based upon the net change in emissions resulting from the replacement of existing F-16 operations with F-35A operations. The F-16 scenario starting point for the base case period for comparison to F-35A operations is 2009. Therefore, the net change in annual operational emissions within the airspace units is equal to emissions from the F-35A action for a given year minus emissions from F-16 operations replaced at that time.

Sources associated with the beddown of F-35A aircraft within the Tucson AGS airspace units and aircraft flight routes would include inflight F-35A aircraft operations. Operational data used to calculate projected F-35A aircraft emissions within these areas are consistent with data used in the project noise analyses (see Section TU 3.2).

Tables TU 3.3–8, TU 3.3–9, and TU 3.3–10 summarize the annual emissions that would occur due to F-35A aircraft operations under Scenarios T1, T2, and T3, respectively, within the Tucson AGS airspace units. Since proposed aircraft operations within the Ruby, Outlaw, and Sells MOAs/ATCAAs and the Rustler Airspace would occur at least 3,000 feet AGL, no emissions are presented for these airspace units. These data show that the operation of F-35A aircraft in airspace units would decrease emissions from current F-16 levels for all Tucson AGS F-35A beddown scenarios. As a result, these actions would produce annual emissions that would not exceed any applicable conformity or NEPA significance threshold of 100/250 tons per year. Therefore, F-35A operations within the Tucson AGS airspace units would produce less than significant impacts on NAAQS pollutant levels.

Table TU 3.3–8. Scenario T1 Annual Operational Emissions within Tucson AGS Airspace Units

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Jackal MOA/ATCAA	0.00	0.16	9.12	0.39	0.04	0.04	1,267
Tombstone MOA/ATCAA	0.00	0.03	1.77	0.08	0.01	0.01	246
R-2301E (BMGR East)	0.00	0.03	1.60	0.07	0.01	0.01	222
VR-263	0.00	0.18	9.88	0.42	0.04	0.04	1,373
Libby AAF	0.03	1.01	11.02	0.89	0.08	0.08	2,916
Total Projected Emissions – Scenario T1	**0.03**	**1.41**	**33.39**	**1.85**	**0.18**	**0.18**	**6,024**
F-16 Future Reductions[1]	**(17.89)**	**(7.82)**	**(198.39)**	**(6.76)**	**(7.17)**	**(7.17)**	**(22,737)**
Net Change Emissions – Scenario T1	**(17.85)**	**(6.42)**	**(164.99)**	**(4.91)**	**(6.99)**	**(6.99)**	**(16,712)**
Conformity and PSD Thresholds	**250**	**250**	**250**	**100**	**100**	**250**	**N/A**

[1] Equal to F-16 airspace emissions eliminated under the F-35A scenario.

Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL; (Number) denotes a negative number.

Table TU 3.3–9. Scenario T2 Annual Operational Emissions within Tucson AGS Airspace Units

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Jackal MOA/ATCAA	0.00	0.32	18.24	0.78	0.08	0.08	2,534
Tombstone MOA/ATCAA	0.00	0.06	3.54	0.15	0.02	0.02	492
R-2301E (BMGR East)	0.00	0.06	3.20	0.14	0.01	0.01	444
VR-263	0.00	0.35	19.77	0.84	0.09	0.09	2,746
Libby AAF	0.06	2.01	22.04	1.79	0.16	0.16	5,833
Total Projected Emissions – Scenario T2	**0.06**	**2.80**	**66.79**	**3.69**	**0.36**	**0.36**	**12,049**
F-16 Future Reductions[1]	**(20.87)**	**(9.43)**	**(223.77)**	**(7.72)**	**(8.18)**	**(8.18)**	**(25,966)**
Net Change Emissions – Scenario T2	**(20.80)**	**(6.62)**	**(156.98)**	**(4.02)**	**(7.83)**	**(7.83)**	**(13,917)**
Conformity and PSD Thresholds	**250**	**250**	**250**	**100**	**100**	**250**	**N/A**

[1] Equal to F-16 airspace emissions eliminated under the F-35A scenario.

Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL; (Number) denotes a negative number.

Table TU 3.3–10. Scenario T3 Annual Operational Emissions within Tucson AGS Airspace Units

Activity Type	*Air Pollutant Emissions (tons per year)*						
	VOCs	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
Jackal MOA/ATCAA	0.00	0.49	27.36	1.17	0.12	0.12	3,801
Tombstone MOA/ATCAA	0.00	0.09	5.31	0.23	0.02	0.02	738
R-2301E (BMGR East)	0.00	0.09	4.79	0.20	0.02	0.02	666
VR-263	0.00	0.53	29.65	1.26	0.13	0.13	4,119
Libby AAF	0.09	3.02	33.06	2.68	0.23	0.23	8,749
Total Projected Emissions – Scenario T3	**0.09**	**4.22**	**100.17**	**5.54**	**0.52**	**0.52**	**18,073**
F-16 Future Reductions[1]	**(20.87)**	**(9.43)**	**(223.77)**	**(7.72)**	**(8.18)**	**(8.18)**	**(25,966)**
Net Change Emissions – Scenario T3	**(20.76)**	**(5.21)**	**(123.59)**	**(2.18)**	**(7.65)**	**(7.65)**	**(7,892)**
Conformity and PSD Thresholds	**250**	**250**	**250**	**100**	**100**	**250**	**N/A**

[1] Equal to F-16 airspace emissions eliminated under the F-35A scenario.

Note: Only includes emissions for aircraft operations that occur below 3,000 feet AGL; (Number) denotes a negative number.

Since the proposed operation of F-35A aircraft within the Tucson AGS airspace units would decrease emissions from current F-16 levels under all F-35A beddown scenarios, these actions would produce less than significant contributions to visibility impairment within the regional Class I areas.

TU 3.4 Safety

TU 3.4.1 Base

TU 3.4.1.1 Base Affected Environment

Ground Safety

The 162 FW Fire Emergency Services (FES) Flight provides fire and emergency protection from one fire station located at Building 50, 1400 E. Super Saber Drive. The 162 FW is located on the northwest side of TUS. The TAA is supported by its own fire department, which works under a strong mutual aid system alongside FES. Tucson Airport Authority Fire Department (TAAFD) is located at 2821 E. Airport Drive and sits off of Alpha 13 taxiway. The departments work under a mutual support agreement for emergency responses.

Anti-Terrorism/Force Protection (AT/FP). As a result of terrorist activities, the DoD and the Air Force have developed a series of Anti-Terrorism/Force Protection (AT/FP) guidelines for military installations. These guidelines address a range of considerations that include access to the installation, access to facilities on the installation, facility siting, exterior design, interior infrastructure design, and landscaping (DoD 2003). The intent of this siting and design guidance is to improve security, minimize fatalities, and limit damage to facilities in the event of a terrorist attack.

Many military installations, such as the 162 FW facilities, were developed before AT/FP considerations became a critical concern. Thus, under current conditions, many units are not able to comply with all present AT/FP standards. However, as new construction occurs, these standards would be incorporated into the design, and as facilities are modified, AT/FP standards would be incorporated to the maximum extent practicable.

Airfield Safety

TUS is located at 32° 06′ 58″ north and 110° 56′ 28″ west, with a field elevation of 2,643 feet MSL. The airfield consists of two parallel runways (11L/29R and 11R/29L) oriented on magnetic bearings 124.4° and 304.4° (northwest to southeast). A third runway (3/21), perpendicular but not connected to the other runways, is oriented on magnetic bearings of 34.4° and 214.4° (northeast to southwest).

Runway 11L/29R is 10,996 feet long by 150 feet wide and is composed of grooved asphalt with a 1,000-foot overrun on each side. Runway elevation slopes upward from 2,578 feet at the 11L end to 2,643 feet at the 29R end (a 0.6 percent slope). Runway 11R/29L is 8,408 feet long by 75 feet wide and is composed of asphalt. This runway is not suitable for high-performance aircraft; it is routinely used by general aviation and is often used concurrently with Runway 11L/29R. Runway elevation slopes upward from 2,574 feet at the 11R end to 2,629 feet at the 29L end (a 0.6 percent slope). Runway 3/21 is 6,000 feet long by 150 feet wide and is composed of grooved asphalt. Runway elevation slopes upward from 2,560 feet at the

Runway 3 end to 2,669 feet at the Runway 21 end (a 0.2 percent slope) (162 FW 2010; AirNav 2010; FAA 2010a).

Runway 11L/29R is equipped with high-intensity runway lights and threshold lights. Runway 11L is equipped with medium-intensity approach lighting system with runway alignment indicator, runway alignment indicator lights, and precision approach path indicator (PAPI). Runway 29R is equipped with PAPI and runway end identifier lights (available daylight hours only). Runway 21 is equipped with PAPI, runway alignment indicator lights, and medium-intensity runway lights. Runways 11R/29L are equipped with runway alignment indicator lights (available daylight hours only for Runway 29L) and medium-intensity runway lights. Runway 11R is equipped with PAPI (162 FW 2010).

TUS has numerous small perpendicular and diagonal taxiways (relative to runways) throughout the airfield. Primary taxiways include Taxiway A, a 75-foot-wide taxiway running parallel to Runway 11L/29R between the runway and the terminal, and Taxiway D, a 75-foot-wide taxiway running parallel between Runway 03/21 and the terminal (162 FW 2010).

Aircraft arming occurs in two locations of Tucson AGS: at one area west of a ramp at the beginning of Taxiway A and at another located on the apron adjacent to Taxiway A17. De-arming of aircraft occurs just inside the Alpha gate on the 162 FW ramp to Runway 3/21 (162 FW 2010).

Airspace in the vicinity of TUS is categorized as Class C and extends from the surface to 6,600 feet MSL; this joins the Class C airspace around Davis-Monthan AFB, forming a close figure eight of Class C airspace.

Albuquerque ARTCC is responsible for the airspace in the vicinity of TUS. Los Angeles ARTCC and Denver ARTCC are responsible for airspace in northern Arizona, and Los Angeles ARTCC is responsible for the airspace to the west. Air traffic controllers in the Tucson International Airport Traffic Control Tower maintain air traffic control and communications with pilots operating on the runways or within airspace in the vicinity. The airfield manager at the 162 FW of Tucson AGS coordinates with the TUS Traffic Control Tower to ensure there is no conflict between military operations and commercial activities (162 FW 2010).

Runway Protection Zones (RPZs). Runway Protection Zones (RPZs) for airports such as TUS are trapezoidal zones extending outward from the ends of active runways at commercial airports and delineate those areas recognized as having the greatest risk of aircraft mishaps, most of which occur during takeoff or landing. The RPZs' function is to enhance the protection of people and property on the ground. This is achieved through airport owner control of RPZs. Development restrictions within RPZs are intended to preclude incompatible land use activities from being established in these areas. Such control includes clearing RPZ areas (and maintaining them clear) of incompatible objects and activities. The RPZ dimension for a particular runway end is a function of the type of aircraft and minimum approach visibility associated with that runway end. For most commercial airports with large aircraft, the departure RPZ begins 11,200 feet from the end of the runway and continues out to 1,700 feet, with a width beginning at 500 feet and expanding as the distance from the runway increases to 1,010 feet wide (FAA 2009a). The approach RPZ begins 200 feet before the runway threshold and extends out 1,700 feet in a reverse of the departure RPZ (FAA 2009a) (see Figure TU 3.4–1).

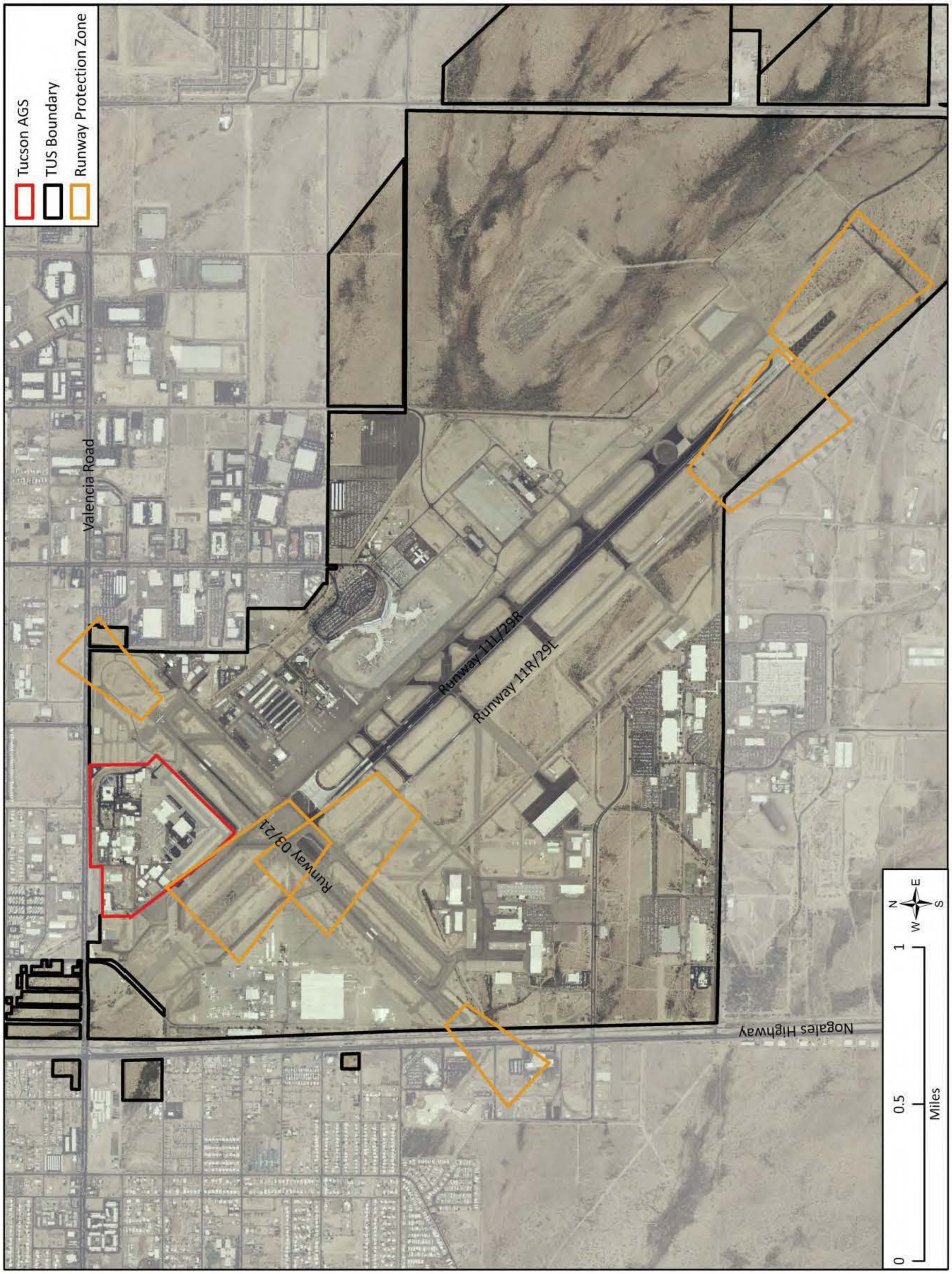


Figure TU 3.4-1. Runway Protection Zones at Tucson AGS

Runway Safety Area (RSA). The Runway Safety Area (RSA) is an area centered on the runway centerline that must be cleared and graded and be capable, under normal dry conditions, of supporting the weight of an airplane without causing structural damage to the airplane or injuries to the occupants. RSA enhances the safety of aircraft that undershoot, overrun, or veer off the runway, and it provides greater accessibility for fire fighting and rescue equipment should an accident occur. RSA is within the Runway Object-Free Area (OFA), which must be kept clear of objects not required for aircraft ground maneuvering. Airport Reference Code (ARC) C-VI design standards, which apply to TUS, require RSA to be 500 feet wide and to extend 1,000 feet beyond each end of the pavement.

Runway Object-Free Area (OFA). OFA is an area on the ground centered on the runway, taxiway, or taxi lane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in OFA for air navigation or aircraft ground maneuvering purposes. Parked airplanes and agricultural operations are not permitted in OFA. Currently, seven airfield waivers are in place for Tucson AGS. They are mainly due to aircraft standoff distances from structures (Tucson ANG 2010). These airfield waivers will be addressed to the extent practicable in siting considerations for new construction required for the F-35A beddown at Tucson AGS.

Runway Obstacle-Free Zone (OFZ). The Runway Obstacle-Free Zone (OFZ) is the airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual navigational aids that need to be located in OFZ because of their function, to provide clearance protection for aircraft landing or taking off from the runway and for missed approaches.

Relevant FAA Design Standards – 14 CFR Part 77 "Objects Affecting Navigable Airspace". Objects located beyond OFA, RSA (including taxiways), OFZ, and RPZ, but in the vicinity of the runway, may be considered obstructions. Objects that are considered obstructions require lighting, lowering, or removal, as determined by 14 CFR Part 77, "Objects Affecting Navigable Airspace."

Ground Obstructions. Currently, seven airfield waivers are in place for Tucson AGS. They are mainly due to aircraft standoff distances from structures (Tucson AGS 2010). These airfield waivers will be addressed to the extent practicable in siting considerations for new construction required for the F-35A beddown at Tucson AGS.

Explosives Safety

162 FW controls, maintains, and stores all ordnance and munitions required for mission performance in accordance with Air Force and Department of Defense Explosives Safety Board (DDESB) safety procedures. All munitions maintenance is carried out by trained, qualified personnel using Air Force–approved technical data for the specific type of ordnance. Weapons and explosives safety at 162 FW is managed by the weapons safety manager and two part-time weapons safety specialists.

Siting requirements for munitions and ammunition storage and handling facilities are based on safety and security criteria. Defined distances are maintained between munitions storage areas and a variety of other types of facilities. These distances, called quantity-distance (Q-D) arcs,

vary in size depending on the type and quantity of explosive material to be stored. Within these Q-D arcs, development is either restricted or prohibited altogether to ensure safety of personnel and minimize potential for damage to other facilities in the event of an accident. In addition, explosives storage and handling facilities must be located in areas where security of the munitions can be maintained at all times. Identifying the Q-D arcs ensures that construction does not occur within these areas. The existing munitions support area would be relocated to provide additional space for construction associated with the F-35A and to conform to DDESB and Air Force explosive Q-D requirements.

Lasers are not explosives, and lasers are employed by current training aircraft at BMGR. Lasers can be set in eye-safe mode for such training as urban combat. Existing range targets used for training with lasers not set in eye-safe mode are specifically cleared for such training and treated as inert munitions ranges. BMGR and associated ranges have targets designated for laser targeting systems, which are currently used by F-16 and other military aircraft.

TU 3.4.1.2 Base Environmental Consequences

Airfield Safety

The Class A rate is not yet determined for the F-35A, and as with any new aircraft, there are always elements of a new system that require testing and evaluation. Resolution of issues discovered during the test and evaluation period would be accomplished before full training begins at any location. Although the F-35A is a relatively new type of aircraft, historical trends show that mishaps of all types decrease the longer an aircraft is operational as flight crews and maintenance personnel learn more about the aircraft's capabilities and limitations. As the F-35A becomes more operationally mature, the aircraft mishap rate is expected to become comparable with a similarly sized aircraft with a similar mission.

The beddown of up to 72 F-35A PAA at Tucson AGS would result in an overall increase in airfield operations compared to current levels, but F-35A aircraft would operate in an airfield environment similar to the current operational environment. Since the F-35A is a new aircraft and would require response actions specific to the aircraft, the emergency and mishap response plans should be updated to include procedures and response actions necessary to address a mishap involving the F-35A and associated equipment. With this update, the 162 FW airfield safety conditions would be similar to existing conditions. Therefore, no significant impact would occur from aircraft mishaps or mishap response.

Capability for fire response is located on base and at TUS. The base fire department is party to mutual aid support agreements with TUS. These functions would continue to occur as they have under current conditions.

Explosives Safety

The proposed project area does not fall within an established Q-D arc, and proposed construction, renovation, and infrastructure-improvement projects related to the F-35A aircraft scenarios would be consistent with Q-D arcs. Therefore, construction activity and subsequent operations would not result in any greater safety risk.

Note that no live ordnance will be loaded or carried by F-35A aircraft at Tucson AGS. The current practice of loading live and heavy inert ordnance at Davis-Monthan AFB for use on training ranges will continue. No live ordnance would be loaded or carried by F-35A aircraft at Tucson AGS. The current practice of loading live and heavy inert ordnance at Davis-Monthan AFB for use on training ranges will continue. F-35A flights to Davis-Monthan AFB would be infrequent (up to 108 per year under Scenario T3) to support one mission per student pilot involving use of live munitions, equating to about two flights per week. This is less than 0.6 percent of the total 18,939 annual baseline sorties recorded at Davis-Monthan AFB. This frequency of use represents a continuation of practices currently conducted by 162 FW F-16 jets. Aircraft carrying live munitions, which depart Davis-Monthan AFB, utilize the southeast corridor, thus avoiding large population areas. Therefore, munitions used by the F-35A would be similar to those associated with current aircraft based at Tucson AGS.

All ordnance is handled and stored in accordance with Air Force and DDESB explosive safety directives, and all munitions handling is carried out by trained, qualified personnel. Therefore, munitions handling would not result in any greater safety risk, and no significant impact related to explosives safety would occur. Laser training would use approved targets on BMGR ranges, and such training would be essentially the same as existing laser training. Therefore, F-35A laser training would not result in any greater safety risk, and no significant impact related to laser training safety would occur.

TU 3.4.2 Airspace

TU 3.4.2.1 Airspace Affected Environment

Flight Safety

The F-35A has not yet accumulated enough flying hours to calculate a Class A mishap rate. Table TU 3.4–1 reflects the cumulative annual Class A mishap rates of the F-15, F-16, and F-22 for the periods for which accident records have been established. The F-15 is included because it represents an aircraft comparable in use and size to the F-35A. The F-22 has had six Class A mishaps in 7 years of testing and operations, primarily during test or weapons evaluation activities with only one loss of life.

Table TU 3.4–1. Class A Accident History

Aircraft	*Reporting Period*	*Accident Rate per 100,000 Hours*	*Lifetime Hours Flown*
F-15	CY 72–FY 09	2.42	5,783,436
F-16	CY 75–FY 09	3.68	9,217,670
F-22[1]	FY 02–FY 09	8.59	69,844

[1] Based on actual hours; the F-22 has not reached 100,000 flights hours as of the date of this publication.

The F-22 is expected to eventually have an accident rate of 2–3 per 100,000 flight hours. This is part of a trend. Combat aircraft are becoming more reliable, even as they become more complex. For example, in the early 1950s, the F-89 fighter had 383 accidents per 100,000 flying hours. A decade later, the rate was in the 20s for a new generation of aircraft. At the time, the F-4, which served into the 1990s, had a rate of fewer than 5 accidents per 100,000 hours. As the F-35A aircraft becomes more operationally mature and pilots who fly it and the technicians who

maintain it gain more experience, mishap rates are expected to decrease and maintain a relatively constant level. The F-35A Class A mishap rate is expected to approach that of the F-15 and F-16 over time.

A Class A mishap can also result in metal debris on the ground. The extent of the debris field depends upon the aircraft accident. Both for reconstructing the cause of the accident and for restoring the accident site as much as possible, the Air Force makes every effort to locate, document, and then clean up debris resulting from the accident.

162 FW maintains detailed emergency and mishap response plans to react to an aircraft accident, should one occur. These plans assign agency responsibilities and prescribe functional activities necessary to react to major mishaps, whether on or off base. Response would normally occur in two phases.

The initial response focuses on rescue, evacuation, fire suppression, safety, elimination of explosive devices, ensuring security of the area, and other actions immediately necessary to prevent loss of life or further property damage. Subsequently, the second, or investigation phase, is accomplished.

The initial response element consists of those personnel and agencies primarily responsible to initiate the initial phase. This element will include the fire chief, who will normally be the first on-scene commander; fire fighting and crash rescue personnel; medical personnel; security police; and crash recovery personnel. A subsequent response team will comprise an array of organizations whose participation will be governed by the circumstances associated with the mishap and actions required to be performed.

The F-35A is capable of dumping fuel in emergency situations. The FAA sets requirements for when and how fuel dumping may occur. This instruction stipulates that fuel can only be dumped above a minimum altitude of 2,000 feet to improve its evaporation, and that a dumping aircraft must be separated from other air traffic by at least 5 miles. Air traffic controllers are also instructed to direct planes dumping fuel away from populated areas and over large bodies of water as much as possible. The same guidelines apply to military aircraft; air bases only permit fuel dumping in a specified area (FAA 2010b).

The wake turbulence behind the aircraft makes most of the fuel released vaporize into a fine mist, which remains in the atmosphere until being broken down by the sun's energy into carbon dioxide and water. Studies of the behavior of dumped fuels have been conducted using kerosene, of which the Jet Propellant-8 fuel that powers the F-35A is a derivative (FAA 2009b). Only a minimal amount of the dumped kerosene actually reaches the ground. If a fuel dump is made at the minimum altitude of 4,921 feet, given a ground temperature of 59 °F and assuming that the air is still, it is calculated that 8 percent of the total fuel dumped will reach the ground. Assuming the aircraft is flying at the minimum speed of 300 miles per hour, this results in the ground being affected by 0.02 grams per square yards, which is the equivalent of 2.09 ounces of kerosene spread over an area of 1,000 cubic yards (FAA 2009b).

The above assumes total stillness of the air, which is highly unlikely. Even the slightest air movements make fuel evaporate almost entirely before it can reach the ground. In 2001, the EPA National Vehicle and Fuel Emissions Laboratory concluded, "Since fuel dumping is a rare

event, and the fuel would likely be dispersed over a very large area, we believe its impact to the environment would not be serious" (EPA 2001).

After all required actions on the site are complete, the aircraft will be removed and the site cleaned up. Depending on the extent of damage resulting from a Class A mishap, only the largest damaged parts may be located and removed from a crash site.

Bird/Wildlife–Aircraft Strike Hazards (BASH). The Air Force BASH Team has 68 bird/wildlife–aircraft strikes recorded from 162 FW in its database for the period between 1985 and 2004. Reported strikes to Arizona ANG aircraft involved several horned larks, two sandhill cranes, a red-tailed hawk, turkey vulture, mourning dove, American robin, American kestrel, sharp-shinned hawk, several swifts and swallows, and a variety of small passerines (Arizona ANG 2010b).

Strikes to civil aircraft at TUS include approximately 150 records in the FAA database from 1990 to 2004. Strikes to civil aircraft involved 10 mourning doves, 1 rock dove, and 20 doves of unreported species. Other bird species include red-tailed hawks, Harris' hawks, a great horned owl, merlin, American robin, European starling, horned larks, sandhill crane, blackbirds, and several small passerines. Also reported struck at the airport were at least three coyotes (*Canis latrans*), a coati (*Nasua nasua*), a raccoon (*Procyon lotor*), a Norway rat (*Rattus norvegicus*), and at least two unidentified bat species. Also reported during the visit, but not in the FAA database, was at least one strike to a javelina (*Tayassu tajacu*) and black-tailed jackrabbits (*Lepus californicus*).

The 162 FW/TUS had a BASH assessment accomplished during March 2005. The assessment looked at historic and predictive bird and wildlife activity and assessed TUS and 162 FW facilities and operational procedures (including visits to Snowbird and the Alert Detachment at Davis-Monthan AFB).

The majority of the airfield is covered in sparse desert vegetation with large bare areas of sandy or gravelly soils. Several large areas of dense desert scrub vegetation, including creosote, cholla cactus, palo verde, and other species occur on the airfield. The bare areas, as well as a broken aircraft parking apron associated with airfield pavements, attract birds such as horned larks, mourning doves, and rock doves for feeding and access to grit. The airfield is surrounded by a fence for security and to deter wildlife from entering the airfield. It was noted during the winter 2005 visit that many species of wildlife, such as coyotes, jackrabbits, javelina, and several species of burrowing rodents, are permanent or transient residents on the airfield inside the fences. Several species of reptiles are also abundant in the dense scrubby vegetation and may attract avian and mammalian predators to the field. Breaches under the fence commonly occur and are repaired when found. Some wildlife such as coyotes have been dispersed or killed under conditions of a depredation permit, but are still abundant in the surrounding areas and on the airfield. The Airport Wash that occasionally fills during rain events develops some native vegetation that may attract a variety of wildlife to the area. Culverts and other drainage structures associated with this canal, as well as natural drainages surrounding the field, are convenient corridors for wildlife to access the field.

The area surrounding the installation also contains features that are attractive to a variety of birds and other wildlife. Much of the surrounding desertscrub habitat is identical to that found on the airfield. Other areas of commercial and urban development attract birds to structures and land uses that may impact the local flying environment. The surrounding mountains, ridges, and associated parks are highly attractive to permanent resident birds and those that migrate along these corridors and stopover points. Parks, golf courses, and a landfill in the area also attract a wide variety of species, some of which may transit the airport between feeding, roosting, and breeding sites. Air Traffic Control provides effective warnings to aircrews during times when direct observations of birds in the vicinity are noted.

The coordinated Wing BASH (91-212) Plan identifies possible wildlife threat to 162 FW operations and outlines comprehensive procedures and responsibilities within the Wing organization (Arizona ANG 2010b). The plan is reviewed and updated annually. Wing organizations have used the 91-212 Plan to develop local checklists and procedures.

To address the issues of bird–aircraft strikes, the Air Force has developed the Avian Hazard Advisory System (AHAS) to monitor bird activity and forecast bird strike risks. Using Next Generation Radar (NEXRAD) weather radars and models developed to predict bird movement, the AHAS is an online, near–real-time geographic information system (GIS) used for bird strike risk flight planning across the contiguous United States and Alaska.

Additionally, as part of an overall strategy to reduce BASH risks, the Air Force has developed a Bird Avoidance Model (BAM) using GIS technology as a key tool for analysis and correlation of bird habitat, migration, and breeding characteristics and is combined with key environmental and manmade geospatial data. The model was created to provide Air Force pilots and flight schedulers/planners with a tool for making informed decisions when selecting flight routes. The model was created in an effort to protect human lives, wildlife, and equipment during air operations. BAM and AHAS computer models are available in every mission planning room/computer and their use has been briefed and incorporated into regular flight operations. The Supervisor of Flying also uses a comprehensive checklist to declare wildlife hazard conditions and trends.

Additionally, the Bird Hazard Working Group (BHWG) meets quarterly and briefs/discusses historic BASH data, bird strike events and statistics, strike damage and costs, and future BASH concerns and procedural reviews. The Vice Wing Commander chairs the BHWG.

Auxiliary Airfield

Libby AAF. Airfield facilities and services available to both military and civilian users at Libby AAF include 24-hour crash/rescue, three lighted runways, Air Traffic Control, Approach Radar, Precision Approach Radar, and Airport Surveillance Radar. Available navigational aids are an Instrument Landing System, a Very High Frequency Omni Range, and a Non-Directional Beacon. The main runway is equipped with a Visual Approach Slope Indicator, and the secondary runway is equipped with a PAPI.

TU 3.4.2.2 Airspace Environmental Consequences

Aircraft Mishaps. The F-35A aircraft beddown at Tucson AGS would operate in a similar manner as the aircraft currently stationed at Tucson AGS. The F-35A would use the existing airspace, including MOAs, ATCAAs, restricted airspace, MTRs, and low-level routes under the same procedures as currently exist. This would not result in any increase in the safety risks associated with aircraft mishaps or any increase in the risks of occurrence of those mishaps.

Flare Use. As described in Chapter 2, Section 2.4.5, and in Section TU 2.2.2, the F-35A would use MJU-61/B defensive flares. These flares are similar to the flare types used by legacy aircraft such as the F-16s. Flares would only be used in airspace units approved for flare use and within authorized altitudes. For Tucson AGS, flares are authorized in the R-2301E and R-2304 with release altitudes ranging between 300 feet AGL and 1,000 feet AGL for the portion of the airspace of government-owned or government-controlled land, depending on fire danger and the types of flares being used. For the portion of R-2301E over the Cabeza Prieta NWR, the minimum release altitude for flares is 1,500 feet AGL. Flares are also authorized in the Sells MOA/ATCAA, with a minimum release altitude of 3,000 feet AGL, and in the Tombstone MOA/ATCAA, with a minimum release altitude of 5,000 feet AGL. Flare use in the Outlaw MOA, Jackal MOA, Ruby MOA, and Rustler Airspace has a minimum release altitude of 2,000 feet AGL or the floor of the airspace unit, whichever is higher. Flares typically burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flare burnout before a flare reaches the ground or water under the training airspace. Luke AFB, which manages the airspace, would also have the discretion to restrict flare use during high or extreme fire danger to minimize the risk of wildland fires. Air Force Instructions (AFIs) are issued for each base to establish restrictions on flare deployment. Typically, these AFIs designate airspace managers or range controllers with the responsibility to identify and publicize fire conditions and specify minimum altitudes for flare use. Fire category restrictions are established for the use of flares, and aircrews are responsible to know the fire code and associated restrictions. Aircrews are briefed on fire conditions prior to a mission, and, if in doubt, the AFIs specifically state an "aircrew will not dispense flares anywhere in the impact area or MOA without positive confirmation that flare use is authorized." Airspace managers or range controllers apply a decision matrix that takes into consideration the fire danger assigned by the U.S. Forest Service to the forests, such as high, very high or extreme, fuel load on the ranges, recent rainfall, humidity, winds, etc. Based on fire danger conditions, use of flares in specific airspaces can change on a daily basis.

On extremely rare occasions (estimated at approximately 0.01 percent of flares dispensed), a flare may not ignite and would fall to the earth as a dud flare. In an extremely rare occasion, where a dud flare is found, it should not be moved, the location should be identified, and the Air Force base public affairs office should be contacted and provided with the dud flare location.

The residual materials for flares, including the MJU-61/B, are described in detail in Chapter 2, Section 2.4.5. All of the MJU-61/B residual flare materials that fall have surface area to weight ratios that would not produce any substantial impact when the residual flare material struck the ground. The largest item is the 0.975 inch × 0.975 inch × 0.5 inch plastic and spring igniter device with a weight of approximately 0.33 ounces in the MJU-61/B flare. This igniter device

would strike the ground with a momentum of 0.046 lb-sec, or approximately the same force as a small hailstone, which would be noticed if it struck a person, but would not be expected to bruise. Additionally, the likelihood of a strike is remote given the areal extent of the airspace, the population density beneath the airspace, and the proportion of time a person is expected to be outside. Therefore, no significant impacts on safety from flare residual materials are expected.

BASH. Use of the AHAS, BAM, and pilot briefings prior to sorties would continue to identify avoidance areas and provide a method to minimize risks from bird strikes in any new airspace regardless of the scenario selected.

Auxiliary Airfield

Libby AAF. Libby AAF has adequate equipment to handle any potential safety issues associated with the operations of the F-35A aircraft; therefore, no impacts on flight safety or ground safety are anticipated due to utilization of Libby AAF.

TU 3.5 Soils and Water

TU 3.5.1 Base

TU 3.5.1.1 Base Affected Environment

Soils

Tucson AGS is located at an elevation of approximately 2,560 feet MSL, along a broad alluvial valley, known as the Tucson Basin, in southeastern Arizona. The topography is generally flat, with a total relief of only 11 feet across the base. The most substantial surface feature on the base is the Airport Wash, which consists of a trapezoidal channel with concrete walls and an earthen bottom, roughly 100 feet wide by 10 feet deep. This feature traverses the northern and eastern perimeters of the proposed project area.

Although earthmoving activities associated with development of Tucson AGS have altered much of the original soil profiles, such that the existing soils are likely a mixture of all the original soil types, the base soils consist of two soil types, including (1) Cave soils and urban land; and (2) Sahuarita soils, Mohave soils, and urban land (NRCS 2010).

The Cave soil unit, which underlies much of the southeastern portion of the base, is composed of a gravelly, fine sandy loam, which is generally found on 0 to 8 percent slopes. The Cave soil unit has moderate permeability; runoff is medium to rapid; and the hazard of water and wind erosion is slight. These soils are generally very shallow, with an underlying lime-cemented hardpan. Areas mapped as urban land consist of soil so altered by construction or obscured by structures and pavement that identification of the soil is difficult or impossible. However, these soils have many of the characteristics of the Cave soil unit. The main limitation of the Cave soil unit, with respect to construction, is the depth to hardpan (i.e., caliche) (NRCS 2003, 2010).

The Sahuarita–Mohave Complex soils are present across most of the base. The Sahuarita unit consists of very gravelly, fine sandy loam on 1 to 5 percent slopes. These soils are deep

and well-drained, but have a high water-erosion hazard. The Mohave soil is a deep and well-drained loam located on 1 to 3 percent slopes. Mohave soils have moderate permeability and water-erosion hazard (NRCS 2003, 2010).

Water

Surface Water. The primary surface-water feature at Tucson AGS is Airport Wash, a tributary of the Santa Cruz River. The confluence of these two water bodies occurs approximately 2.5 miles northwest of Tucson AGS. Airport Wash is an ephemeral drainage that delineates the northern and eastern boundaries of the base (Ogden 1998). No federally designated wetlands have been identified at Tucson AGS. Due primarily to the aridity of the location, combined with topographic and soil characteristics, Tucson AGS does not support wetlands or the soil hydrology characteristics likely to support establishment of wetlands (Arizona ANG 2003).

Floodplains. A 100-year floodplain associated with Airport Wash has been identified by the Federal Emergency Management Agency (FEMA) in the vicinity of the northern boundary of Tucson AGS. However, only a small portion of Tucson AGS would be subject to flooding during such an event. Further, according to the FEMA model, a 100-year flood associated with Airport Wash would be less than 1 foot deep on Tucson (Ogden 1998).

Groundwater. The valley fill alluvium in the Tucson Basin is divided into three aquifers: the upper regional, lower regional, and undivided regional aquifers. The upper regional aquifer, consisting of the Fort Lowell Formation and Quaternary deposits, is generally composed of gravelly sand with some silty sand and sandy silts and extends to a depth of approximately 150 feet. The lower regional aquifer, consisting of the lower Tinaja Beds and the Pantano Formation, is composed of clayey sand, with lenses of gravelly sand and sandy clay. The upper regional and lower regional aquifers are separated by a thick clay layer, which is approximately 100 to 160 feet thick and acts as an aquitard. This aquitard pinches out toward the northwest, north of Airport Wash, resulting in an undivided regional aquifer, composed primarily of sandy gravels with lenses of clay, clayey sand, and gravelly clay near the northern and western boundaries of the aquitard. The sandy gravels grade westward into sandy clays, clayey sands, and clayey gravels, interbedded with thin volcanic flows (162 FW 2006).

The upper regional aquifer, which consists of an upper subunit, a middle aquitard, and a lower subunit, constitutes the majority of groundwater transport in the immediate vicinity of Tucson AGS. Both the upper and lower subunits are composed of well-graded, predominantly coarse-grained, saturated sand. However, a distinctive feature of the lower subunit is the presence of a northwest–southeast trending sand channel that traverses Tucson AGS. The middle aquitard is composed of sandy silt, with varying amounts of caliche cementation and clay. Groundwater flow direction in the upper and lower subunits is toward the northwest, with a gradient of 10 to 50 feet per mile. The depth to groundwater is approximately 90 feet below ground surface (162 FW 2006).

Because the City of Tucson depends exclusively upon aquifers of the Tucson Basin for its drinking water supply, the basin groundwater system is designated a sole-source aquifer under the Federal Safe Drinking Water Act. Wells from which the City of Tucson extracts its water are considered suitable for potable use. However, the city no longer draws water from wells

located within 1 mile of Tucson AGS due to the presence of trichloroethene (TCE)-contaminated groundwater associated with the Tucson International Airport Area (TIAA) Superfund site. Before the discovery of contaminated groundwater, wells within 1 mile of Tucson AGS provided water for approximately 47,000 people (Ogden 1998).

At present, Tucson AGS receives potable water from the Tucson Water Company (Ogden 1998).

TU 3.5.1.2 Airspace Affected Environment

The land beneath the training airspace is characterized by localized steep rocky slopes that are susceptible to rockfalls, which occur most frequently during early spring, when there is abundant moisture and repeated freezing and thawing. The rocks may freefall, slide, or tumble down slopes in an erratic manner. When a large number of rocks plummet downward at high velocity, it is called a rock avalanche. Rockfalls are caused by the loss of support from underneath or detachment from a larger rock mass. Ice wedging, root growth, or ground shaking, as well as a loss of support through erosion or chemical weathering, may start the fall. However, man's activities can also cause rocks to fall sooner than would occur naturally. Excavations into hills and mountainsides for highways and buildings frequently aggravate rockfalls. Other causes include vibration from passing trains, blasting, changes in groundwater conditions, and sonic booms (Colorado Geological Survey 2010).

TU 3.5.1.3 Base Environmental Consequences

Soils and Surface Water. Depending on the F-35A aircraft scenario chosen for Tucson AGS (i.e., Scenario T1, T2, or T3), construction would disturb 33.0, 33.4, or 33.7 acres, respectively, most of which has been previously disturbed. The main limitation of the Sahuarita–Mohave Complex soils is the high water-erosion hazard (NRCS 2003). Removal of existing pavement, grading, and excavations would expose soil to potential wind and water erosion, which, in turn, could result in sedimentation of nearby drainages, including the adjacent Airport Wash, a tributary to the Santa Cruz River. Sedimentation occurs when soil particles are suspended in surface runoff or wind and are deposited in streams or other water bodies. Construction and other ground-surface-disturbing activities can accelerate erosion by removing vegetation, compacting or disturbing the soil, changing natural drainage patterns, and covering the ground with impermeable surfaces (pavement, concrete, buildings). When the land surface is impermeable, storm water can no longer infiltrate, resulting in larger amounts of water that can move more quickly across a site and carry larger amounts of sediment and other pollutants to streams and rivers.

Because more than 1 acre would be disturbed by construction, an Arizona Pollutant Discharge Elimination System storm water permit would be required. Under the permit, Tucson AGS must develop a construction Storm Water Pollution Prevention Plan that describes BMPs to be implemented to eliminate or reduce sediment and non-storm-water discharges.

Surface erosion is best controlled by stabilization practices, such as seeding, mulching, surface roughing, and buffer strips, as well as minimizing the disturbed area and the time of exposure to disturbance. In addition, erosion can be controlled by structural actions such as construction of silt fences and straw bales, check dams, sediment traps, compost filter berms, and stabilized entrance and exit points to construction sites. With proper design and implementation of the

Storm Water Pollution Prevention Plan, impacts from erosion and offsite sedimentation would be negligible and significant impacts would not occur.

The main limitation of the Cave soil unit, with respect to construction, is the depth to hardpan (i.e., caliche). Heavy machinery would be required for leveling or making shallow excavations for utilities. Sandy and gravelly material below the caliche is subject to caving or slumping if excavations are deep (NRCS 2003). However, these soil limitations can be mitigated through standard engineering and modern construction techniques, such that significant impacts would not occur.

Floodplains. The implementation of any of the F-35A aircraft scenarios would not include construction or operation within the existing designated 100-year floodplain of Airport Wash. In addition, the construction would not affect the designated 100-year floodplain; therefore, no flood-related impacts would occur. The current FEMA Flood Insurance Rate Map is dated February 8, 1999 (FEMA 1999) (see Figure TU 3.5–1).

Groundwater. At present, Tucson AGS receives potable water from the Tucson Water Company. The city no longer draws water from wells within 1 mile of Tucson AGS due to the presence of TCE-contaminated groundwater associated with the TIAA Superfund site (Ogden 1998). The implementation of any of the F-35A aircraft scenarios would not include groundwater withdrawals; therefore, groundwater impacts would not occur.

TU 3.5.2 Airspace

Water Quality. F-35A pilots would not train with chaff. However, flares would be used as part of the Proposed Action, as described in Chapter 2, Section 2.4.5, Ordnance and Defensive Countermeasures. Each defensive flare consists of small pellets of highly flammable material that burn rapidly at extremely high temperatures. Flares provide a heat source, other than the aircraft's engine exhaust, to decoy heat-sensitive or heat-seeking targeting systems. The flare ignites upon ejection from the aircraft and burns completely within approximately 3.5 to 5 seconds, or approximately 400 to 500 feet from its release point (Air Force 1997a).

Toxicology studies on flare residual materials indicate that no chemical effects are expected for water resources, since the primary material in flares, magnesium, is not highly toxic. Pieces of plastic, Mylar, and/or paper fall to the earth with each bundle of flare deployed. Such materials are inert and are not likely to adversely impact water quality. The probability of a dud flare hitting the ground is extremely low, at an estimated rate of 0.01 percent of flares deployed. In the unlikely event that an intact dud flare lands in a water body, such as a wetland, creek, pond, or lake, there would be minimal to no effects of the metallic magnesium from the flare on the water body. Magnesium is already a substantial natural component of the earth, and the amount from a flare would be comparably insignificant (Air Force 1997a). Due to the low concentrations of the flare residue and the low probability of flare residue coming in contact with water bodies, flare releases are not expected to cause significant water quality impacts.

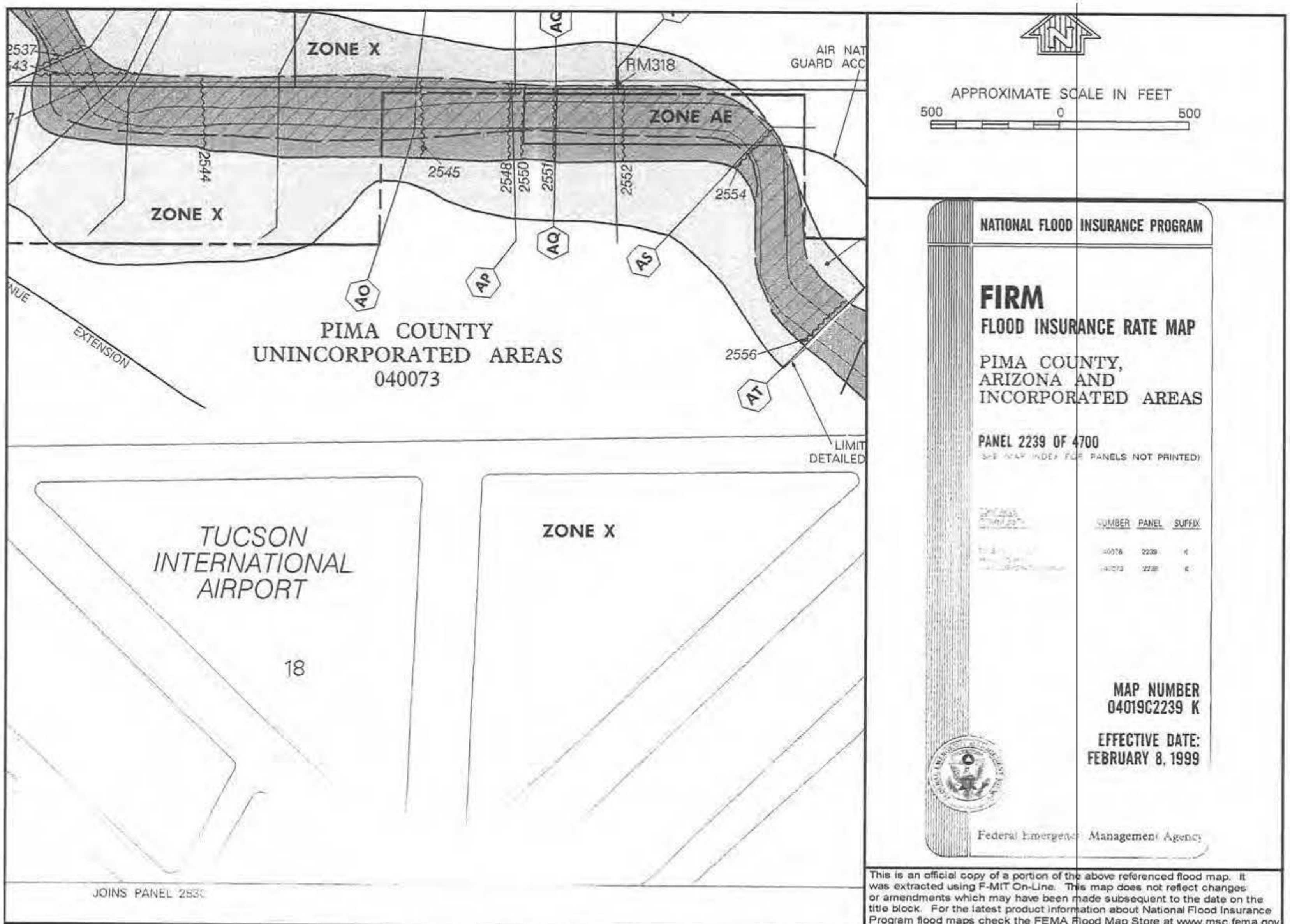


Figure TU 3.5–1. Tucson AGS FEMA Flood Insurance Rate Map

Soils. Lichens and cyanobacteria are important components of soil crust communities in the intermountain western United States, especially in areas protected from domestic grazing, wildfire, and off-road vehicle activity. Their presence is critical for soil stability, as well as for the contribution of nitrogen to the ecosystem in a form available to higher plants. Soil crusts in general, and lichens and cyanobacteria in particular, tend to be very sensitive to human-related perturbation, including air pollution (St. Clair et al. 1993; Belnap et al. 2001). The Proposed Action would have a large carbon footprint, and the increased pollution could affect soil crusts, which play a key role in retaining soil moisture and reducing water loss. Such soil crust impacts would be unavoidable.

Rockfalls. Although not common, sonic booms can potentially cause rockfalls to occur in localized areas of steep rocky slopes. Rockfalls are potentially dangerous in areas where people and/or property reside immediately downslope. Such failures would occur along slopes that are already susceptible to failure by other natural and/or manmade factors, as previously described. Typically, slopes prone to rockfalls in developed areas, such as along highway road cuts, have been engineered with protective devices, including wire netting and impact walls.

As a result, slope failure reactivation by sonic booms would not be outside the norm for any given slope, such that significant impacts would not occur.

No other ground disturbance would occur in association with airspace operations; therefore, no additional impacts would occur with respect to soil and water.

TU 3.6 Vegetation and Wildlife

TU 3.6.1 Base

TU 3.6.1.1 Base Affected Environment

Vegetation

Tucson AGS is located in the city of Tucson, Arizona, within the Arizona Uplands subdivision of the Sonoran Desert. The Arizona Uplands is generally characterized by high temperatures, high solar radiation, bi-seasonal precipitation, and diverse vegetation and wildlife.

The Tucson AGS property has predominantly been developed into runways, tarmac, parking lots, building footprints, and other impervious surfaces. Only a few, small, disjunct grass-dominated patches of vegetation remain. To the east and south of Tucson AGS, some less-developed parcels continue to support native vegetation. A recent final environmental assessment for construction activities on Tucson AGS determined that two primary vegetation associations, creosotebush-mixed scrub and mesquite-mixed scrub, are characteristic of the native vegetative communities in the airport vicinity (Arizona ANG 2003).

Creosotebush-Mixed Scrub. Covering the majority of the open areas with sloping landscapes and well-drained, compacted soils, this association is dominated by large shrubs such as creosotebush (*Larrea divaricata*) and foothill palo verde (*Parkinsonia microphylla*). Other plants that occur usually include thorns such as whitethorn acacia (*Acacia constricta*), ocotillo (*Fouquieria splendens*), fishhook barrel cactus (*Ferocactus wislizenii*), teddybear cholla

(*Cylindropuntia bigelovii*), jumping cholla (*C. fulgida*), and staghorn cholla (*C. versicolor*). The understory supports desert zinnia (*Zinnia acerosa*), burro weed (*Isocoma tenuisecta*), Lehmann's lovegrass (*Eragrostis lehmanniana*), grama grasses (*Bouteloua* spp.), and three-awn grasses (*Aristida* spp.).

Mesquite-Mixed Scrub. This association, dominated by velvet mesquite (*Prosopis velutina*), occurs on the poorly drained margins of washes and ephemeral streams southeast of Tucson AGS. The mesquite-mixed scrub assemblage includes many species found in creosotebush-mixed scrub described above, including whitethorn acacia, foothill palo verde, Lehmann's lovegrass, grama grasses, and three-awn grasses. Desert broom (*Baccharis sarothroides*) is also characteristic of this association in the project area.

Wildlife

The landscaped vegetation present on developed areas on and around Tucson AGS may supply food and cover for wildlife species common to southern Arizona and habituated to human presence and disturbed areas. Species such as striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor mexicanus*), collared peccary or javelina (*Pecari tajacu*), coyote (*Canis latrans*), and desert cottontail (*Sylvilagus audubonii*) typically occur in urban areas of this region. Often scavengers and generalists, these species take advantage of cover and food sources humans inadvertently provide by landscaping or waste (e.g., trash cans, landfills). Birds that are expected to occur in the Tucson AGS vicinity and adjacent areas associated with human habitation and landscaped habitats include mourning dove (*Zenaida macroura*), horned lark (*Eremophila alpestris*), European starling (*Sturnus vulgaris*), great-tailed grackle (*Quiscalus mexicanus*), mockingbird (*Mimus polyglottos*), and house finch (*Carpodacus mexicanus*). Other wildlife present in areas that retain some elements of natural habitat characteristics in the Tucson AGS vicinity include reptiles, such as western whiptail (*Cnemidophorus tigris*) and side-blotched lizard (*Uta stansburiana*); small, nocturnal, burrowing rodents such as pocket mice (*Chaetodipus* spp.) and kangaroo rats (*Dipodomy*s spp.); bats; and diurnal, burrowing species, such as ground squirrels (Arizona ANG 2003).

TU 3.6.1.2 Base Environmental Consequences

Construction

For the beddown of F-35A aircraft at Tucson AGS, a minimum of 33 acres under Scenario T1 (addition of 24 aircraft) and a maximum of 33.7 acres under Scenario T3 (addition of 72 aircraft) of land would be disturbed for construction of facilities needed to support F-35A training at Tucson AGS (see Table TU 2.1–2). For all land disturbance calculations, 10 percent was added outside of the project footprints to account for temporary land disturbance likely to occur for equipment access and laydown areas. Construction activities may include demolition and renovation of existing structures and infrastructure improvements on Tucson AGS. Planned construction would be confined to previously developed and disturbed areas at Tucson AGS.

For construction and demolition activities in developed portions of Tucson AGS, no long-term effects on vegetation and wildlife are anticipated. During demolition and construction activities on Tucson AGS, the amount of noise and dust generated is expected to increase during working hours, although normal precautions would be taken to minimize these effects

(see Sections TU 3.2, Noise, and TU 3.3, Air Quality). Additionally, measures to control erosion and siltation would be included as part of the project implementation. Revegetation of temporarily disturbed areas would be conducted as directed by the base to minimize the potential for continued erosion and dust generation and decrease the duration of temporary habitat loss. To comply with the Migratory Bird Treaty Act and the DoD Bat Protection Memorandum of Understanding and to assure no habitation by nesting birds or sensitive bat species, abandoned buildings would be surveyed for these species before their demolition, removal, or renovation. Because areas proposed for construction on Tucson AGS have already largely been disturbed, no significant adverse effects on vegetation of wildlife are expected.

Operations

No effects on vegetation are expected from F-35A operations in the vicinity of Tucson AGS. Wildlife species on and near Tucson AGS exist in an airfield environment, which includes regular takeoffs, landings, and low-level overflights by military aircraft. The F-35A aircraft would employ similar departure, closed patterns, and landing procedures as those currently used by Tucson AGS aircraft. F-35A operations would adhere to existing restrictions and avoidance procedures. The noise levels associated with the F-35A aircraft vary considerably, according to the actual flight profile. Noise levels expected as a result of implementing the F-35A aircraft scenarios would be qualitatively similar to the existing noise environment. Wildlife species in the vicinity of Tucson AGS live in an airfield environment and would not be expected to be adversely affected by changes in aircraft overflight and noise associated with transitioning to the F-35A aircraft.

TU 3.6.2 Airspace

TU 3.6.2.1 Airspace Affected Environment

Vegetation

The proposed airspace associated with the Tucson AGS alternative (see Figure TU 2.2–1) extends over a large geographical area having diverse topography and, consequently, encompassing vegetation or life zones that vary from the Lower Sonoran Life Zone (deserts) to the Canadian Life Zone (coniferous forests), including higher-elevation forests in the White Mountains in the eastern part of Arizona. This airspace overlies extensive, relatively undeveloped areas in Arizona and New Mexico with diverse terrain and vegetation, some of which provide high-quality habitats for wildlife. Table TU 3.6–1 summarizes these vegetation/habitat life zones.

Table TU 3.6–1. Vegetation/Life Zones Under Tucson AGS Primary Use Airspace

Vegetation/Life Zone	Acres Under the Airspace	Percentage of the Total Area Under Airspace
Lower Sonoran Zone		
Desertscrub		
- Arizona Uplands	3,797,850	21
- Lower Colorado River Valley	2,227,458	12
- Chihuahuan	811,600	4
Subtotal	**6,836,908**	**37**
Upper Sonoran Zone		
Woodlands (conifer, evergreen, chaparral)	3,654,112	20
Grasslands (plains and semidesert)	5,489,422	30
Subtotal	**9,143,534**	**50**
Canadian Zone		
Montane Coniferous Forests	2,019,625	11
Hudsonian Zone		
Subalpine Conifer Forests and Grasslands	208,434	1
Playas	9,431	< 1
Total	**18,217,932**	**100**

Source: AZGFD 2004a.

The habitat characteristics of lands underlying the project airspace are described below.

Lower Sonoran Life Zone. The Lower Sonoran Life Zone encompasses desertscrub habitat types of both the Arizona Uplands and Lower Colorado River Valley subdivisions of Sonoran desertscrub and also a small area of Chihuahuan desertscrub in southeastern Arizona and adjacent New Mexico. Desertscrub was mapped as covering lands on approximately 6,836,908 acres (37 percent) of the ROI under the project airspace. Vegetation in this life zone is dominated by various shrub species that fall under the term desertscrub, including small-leaved trees, numerous shrubs, and cacti of many varieties. The primary desert trees that occur on rocky slopes include foothill palo verde (*Parkinsonia microphylla*), ironwood (*Olneya tesota*), saguaro (*Carnegiea gigantea*), and tree-like chollas (*Cylindropuntia* spp.) (Lowe 1980). Where dry washes (arroyos) occur, other trees that take advantage of the temporary water source include blue palo verde (*Parkinsonia floridum*), mesquite, catclaw (*Acacia greggii*), smoketree (*Dalea spinosa*), and desert willow (*Chilopsis linearis*). The predominant community that occupies valleys, mesas, and terraces in the Lower Colorado River subdivision of Sonoran desertscrub is the creosotebush-bursage (*Larrea-Franseria)* community (Lowe 1980). Periodically flooded valley bottoms with fine-textured soils support salt-tolerant plants such as desert saltbush (*Atriplex polycarpa*).

Creosotebush is the most widespread and abundant plant in the Chihuahuan desertscrub, especially on gravel fans in lower elevation shrubland, occurring often with tarbush as a co-dominant species (Dick-Peddie 1993). On deep soils, however, honey mesquite (*Prosopis glandulosa*) becomes the dominant plant, and cacti are abundant, particularly prickly pear. Other plants that are common to abundant in the province include yuccas, lechuguilla (*Agave lechuguilla*), and ocotillo (Bailey 1995). Cottonwoods (*Populus* spp.) occur along waterways where moisture is adequate. This habitat type was mapped in scattered patches under 811,600 acres (4 percent) of the southeastern portion of the airspace. Airspace units that overlie Arizona Upland and Lower Colorado River Valley subdivisions of Sonoran desertscrub include the Sells, Outlaw, Morenci, and Jackal MOAs and BMGR, including R-2301E. Some airspace

units are mentioned more than once, as they overlap more than one life zone. Airspace units that overlie Chihuahuan desertscrub include the Tombstone and Morenci MOAs and VR-263.

Upper Sonoran Life Zone. The Upper Sonoran Life Zone represents the majority of the Tucson AGS airspace, occurring under 9,143,534 acres (50 percent) of the project airspace. This life zone encompasses distinct grassland and woodland vegetation communities. Desert grassland communities occur as transitional landscapes between the desert and woodlands that grow at higher elevations (Lowe 1980). These grasslands survive on deeper soils protected from erosion and little competition from shrubs and cacti and support stands of bunchgrasses such as grama grasses (*Bouteloua eriopoda*, *B. gracilis*, *B. curtipedula, B. filiformis,* and *B. hirsuta*). Other grasses that can be intermixed include plains lovegrass (*Eragrostis intermedia*), plains bristlegrass (*Setaria machrostachya*), and sand dropseed (*Sporobolus cryptandrus*). Plains grasslands form a more-continuous cover of grasses, including gramas, muhly (*Muhlenbergia* spp.), needlegrasses (*Stipa* spp.), dropseeds (*Sporobulus* spp.) and sprangletop (*Leptochloa* spp.)

Airspace units that overlie grasslands include the Sells, Ruby, Tombstone, Outlaw, Jackal, and Morenci MOAs and VR-263.

There are three primary woodland vegetation types (conifer, chaparral, and evergreen) that occur under the proposed airspace located to the south of the Gila River between 4,000 and 6,500 feet elevation. Chaparral habitat occurs in the central portion of Arizona as dense, shrubby vegetation of fairly uniform height between 3 and 7 feet (Lowe 1980). These plants include tough-leaved shrubs such as scrub oak (*Quercus turbinella*), mountain-mahogany (*Cercocarpus* spp.), manzanita (*Artostaphylos* spp.), sumac (*Rhus* spp.), and *Ceanothus* spp. In the evergreen woodland, a variety of oaks (*Quercus* spp.) are common, along with alligator juniper (*Juniperus deppeana*), one-seed juniper (*J. monosperma*), and Mexican piñon (*Pinus cembroides*). These woodland stands tend to be more open than chaparral and can have understories of grasses, shrubs, succulents, and cacti (Lowe 1980). Conifer or oak-pine woodlands occur at the elevation just below the ponderosa pine (*P. ponderosa*) forests and are characterized by the presence of Chihuahua pine (*P. leiophylla*) and Apache pine (*P. engelmanni*). Conifers from the evergreen woodlands may be intermixed.

Airspace units that overlie woodlands include the Sells, Ruby, Tombstone, Outlaw, Jackal, Reserve, and Morenci MOAs and VR-263.

Canadian Life Zone – Montane Coniferous Forests. The Canadian Life Zone encompasses montane (mountain) forest communities that occur from about 7,500 to 9,500 feet elevation, primarily under the eastern portion of the ROI. This life zone occurs on approximately 2,019,625 acres (11 percent) under the airspace within the ROI. Fir forest stands, consisting of predominantly Douglas fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*), are sustained on higher amounts of precipitation received primarily in the winter as snow (Lowe 1980). At higher elevations, alpine fir (*Abies lasiocarpa*) may be present. Fir forests typical of Canadian Life Zones often intermix with the ponderosa pine forests at lower elevations that tend to occupy ridges and southerly exposures (Lowe 1980). Deciduous understory trees that occur in this life zone include Gambel oak (*Quercus gambelii*), box elder (*Acer negundo*), water birch (*Betula occidentalis*), and blueberry elder (*Sambucus glauca*). Because of forest density, few

ground cover plants are present. Following burns and other major disturbance, aspens may form a subclimax forest community.

Airspace units that overlie the Canadian Life Zone include the Jackal, Reserve, and Morenci MOAs.

Hudsonian Life Zone – Subalpine Conifer Forests and Grasslands. The ecological requirements of conifers in the Hudsonian and Canadian Life Zones, primarily spruces, firs, and white pines, are very similar; therefore, the higher-elevation life zones overlap a great deal (Lowe 1980). The spruce–fir forests of the Hudsonian Life Zone occur from 8,500 to 11,500 feet, which in the ROI includes the White Mountains. Airspace over this life zone has been mapped as covering 208,434 acres (1 percent) of the ROI. Primary tree species are the Engelmann spruce (*Picea engelmannii*), blue spruce (*Picea pungens*), alpine fir, limber pine (*Pinus flexilis*), and bristlecone pine (*P. aristata*). Deciduous trees present in open areas include Rocky Mountain maple, bitter cherry (*Prunus emarginata*), willows, and thin-leaf alder (*Alnus tenuifolia*). Forest openings support grasslands that may contain a great variety of colorful flowering forbs such as columbines (*Aquilegia* spp.) and gentians (*Gentiana* spp.), as well as sedges, mosses, and lichens.

Small portions of the Jackal and Reserve MOAs overlie areas within the Hudsonian Life Zone.

Wetlands, in the form of playa habitats, are discussed in Section TU 3.7, Wetlands and Aquatic Communities.

Wildlife

Sonoran Life Zones. The wildlife species that inhabit lands under the proposed airspace units that occur south of Tucson AGS (Sells, Ruby/Fuzzy, BMGR, and Tombstone MOAs) are primarily typical of the Sonoran Desert. These species include mostly diurnal lizards and nocturnal snakes and aridity-adapted bird species, such as the greater roadrunner (*Geococcyx californicus*), black-throated sparrow (*Amphispiza bilineata*), cactus wren (*Campylorhynchus brunneicapillus*), ash-throated flycatcher (*Myiarchus cinerascens*), Scott's oriole (*Icterus parisorum*), and phainopepla (*Phainopepla nitens*). The Arizona Partners in Flight Conservation Plan lists bird species that are indicators of Sonoran desertscrub habitat health; these include Costa's hummingbird (*Calypte costae*), gilded flicker (*Colaptes chrysoides*), rufous-winged sparrow (*Aimophila carpalis*), Le Conte's thrasher (*Toxostoma lecontei*), and purple martin (*Progne subis*) (Latta et al. 1999). Smaller mammals that use the habitats in this life zone include primarily nocturnal rodents; lagomorphs, including cottontails and black-tailed jackrabbits (*Lepus californicus*); kit fox (*Vulpes macrotis*); badger (*Taxidea taxus*); bobcat (*Felis rufus*); and coyote. The cottontail and coyote are expected to overlap with areas of human habitation as opportunities for foraging/hunting arise. Large mammals, such as coyote, mountain lion and desert mule deer, and corvids (crows and ravens) occur from the deserts into the forested areas.

The BMGR MOAs and ranges provides habitat for at least 62 species of Sonoran Desert mammals, over 200 species of birds, 5 species of amphibians, and 37 species of reptiles (Arizona ANG 2003). Characteristic species of the BMGR area include those listed above, as well as desert bighorn sheep (*Ovis canadensis nelsoni*), javelina, Sonoran collared lizard (*Crotaphytus nebrius*), and sidewinder (*Crotalus cerastes*), plus sensitive species discussed in Section TU 3.8.

Tree-Dominated Life Zones. The majority of wildlife species have wider geographic and ecological ranges than most individual plant species and are not usually associated with only one life zone. The tree-dominated life zones include the Canadian and Hudsonian Life Zones. Typical species that occur in the higher-elevation foothills and forests of these life zones under the easternmost project airspace (Jackal, Reserve, and Morenci MOAs) include black bear (*Euarctos americanus*), various woodpeckers, black-billed magpie (*Pica hudsonia*), piñon jay (*Gymnorhinus cyanocephalus*), raptors, and tree squirrels (*Sciuridae* spp.). The Apache National Forest, which underlies all of the Reserve MOA, lists Abert squirrel (*Sciurus aberti*), northern goshawk (*Accipiter gentilis*), pygmy nuthatch (*Sitta pygmaea*), wild turkey (*Meleagrisgallopavo*), elk (*Cervus canadensis),* and hairy woodpecker (*Picoides villosus*) as some of its management indicator species (ASNF 2008).

Auxiliary Airfield

Libby AAF. Libby AAF is located in the Arizona ANG complex at Fort Huachuca just outside Sierra Vista, Arizona, which is approximately 75 miles southeast of Tucson. At Libby AAF, many of the native plant communities have been replaced by the presence of pavement, buildings and other structures, and landscaping (Arizona ANG 2008). Landscaped areas around buildings and administrative areas are covered in grass, shrubs, and trees. The areas of native vegetation that remain in the vicinity of Libby AAF are characterized by shrublands of the Chihuahuan desertscrub vegetation type mixed with desert grassland. Common wildlife species occurring in the Libby AAF vicinity include desert mule deer (*Odocoileus hemionus crooki*), mountain lion (*Felis concolor*), coyote, scaled quail *(Callipepla squamata*), and collared lizard (*Crotaphytus collaris).* Because Libby AAF is a joint use civilian and military airfield, the species present in the area are accustomed to human presence and disturbance in the form of vehicle and aircraft traffic on a regular basis.

TU 3.6.2.2 Airspace Environmental Consequences

Operations impacts on biological resources from the F-35A aircraft scenarios could result from low-level overflights and associated noise, sonic booms, munitions use and the use of flares, and bird–aircraft collisions. A comprehensive review of current literature evaluating potential effects on wildlife and habitat from overflight, noise, and sonic booms is presented in Appendix B.

Low-Level Overflight and Noise. All primary use airspace units that would be used for F-35A training are currently used as active military airspace by military jet aircraft; therefore, wildlife in these areas have previous exposure to military jet overflight, including low-level overflight and noise, sonic booms, and use of munitions and defensive countermeasures that would be associated with introducing the F-35A aircraft and will be analyzed in this section. The sudden visual appearance of the aircraft and onset of noise from a low-level overflight has the potential to startle wildlife. Both the visual appearance and noise levels of aircraft diminish rapidly with increasing altitude.

Unlike the F-16, F/A-18, and A-10 aircraft, which regularly use the airspace and MTRs and include training at low altitudes, no F-35A low-level flight training is expected to occur below 500 feet AGL. Most of the F-35A training would occur at altitudes exceeding 5,000 feet AGL, with approximately 3 percent of training time projected to occur between 500 feet AGL and

2,000 feet AGL. Table TU 2.2–3 provides a comparison of percentages of flight hours at different altitudes between existing A-10 and F-16 aircraft currently using the airspace and proposed F-35A use. For A-10 aircraft, 96 percent of flight hours are spent below 10,000 feet AGL and for F-16 aircraft, 56 percent of flight hours are spent below 10,000 feet AGL, whereas for F-35A aircraft, 85 percent of flight hours would be spent above 10,000 feet AGL. Under Scenario T3 (72 F-35A aircraft), the change in total annual sortie-operations flown in the primary use training airspace units relative to baseline conditions would range from a 59 percent decrease to an increase of 137 percent (see Table TU 2.2–1). Under Scenario T3, MTR use would decrease by about 4 percent compared to baseline conditions (see Table TU 2.2–2). Animals such as raptors, including bald and golden eagles, and ungulates, such as mule deer or bighorn sheep, living beneath those airspace units in which there would be an increase in operations are not expected to be adversely affected by additional overflights from the F-35A.

At the altitudes where the F-35A would spend most of its time, overflight noise (as perceived from the ground) would increase relatively gradually from ambient to the peak noise level. Overflight events at these altitudes would not be expected to be startling to animals or to have other adverse impacts. In addition, wildlife and domestic animals regularly exposed to noise events such as overflights have been shown to habituate to those stimuli that prove to be of no danger (Bayless et al. 2004; Brown et al. 1999; Conomy et al. 1998; Krausman et al. 1998; Workman et al. 1992). Based on (1) the very low percentage of time spent in low-level flight by F-35As training within the airspace and (2) the previous and ongoing exposure of wildlife to training by other aircraft in the airspace, no significant adverse effects on vegetation or wildlife from overflights or noise are anticipated to be associated with the addition of F-35A training.

Sonic Booms. The sound of a sonic boom can be like thunder: either a sharp double clap if the aircraft is directly overhead or a distant rumble if the aircraft is at a distance. The intensity of the boom (overpressure) at the Earth's surface decreases with an increase in the altitude at which the aircraft goes supersonic. Overall, studies of wildlife and domestic animals have demonstrated that behavioral responses are of short duration and rarely result in injury or negative population effects (Krausman et al. 1998; Weisenberger et al. 1996). Habituation to more-frequent sonic booms may also occur (e.g., Ellis et al. 1991; Workman et al. 1992). Habituation to thunderclaps and rumble associated with seasonally frequent thunderstorms within the ROI is also expected to minimize response of birds, mammals, and domestic animals to sonic booms.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training. Supersonic flight is authorized only in the Sells MOA/ATCAA at or above 10,000 feet MSL and in R-2301E at 5,000 feet AGL or above (see Table TU 2.2–1). Supersonic flight is not authorized on MTRs. F-35A supersonic training is expected to be similar to the F-16 training that was conducted until recently in the primary use airspace in terms of the time spent at supersonic speeds per sortie, the types of maneuvers conducted, and the Mach numbers used during training. However, sonic booms produced by the F-35A would typically be slightly more intense than sonic booms generated by F-16 aircraft during equivalent maneuvers (see Table TU 3.2–6). The increase in supersonic noise resulting from the proposed F-35A beddown would be offset by the reduction in supersonic noise levels resulting from drawdown of F-16 aircraft from Luke AFB and Tucson AGS. Under all beddown scenarios, the average number of sonic booms per day would decrease slightly beneath all

primary training airspace units. Based on the fact that sonic booms and seasonally frequent thunderclaps currently exist in the training airspace, that the majority of training flights take place at altitudes above 10,000 feet MSL, and that free-ranging wildlife have generally minimal responses to sonic booms, it is not expected that the projected incremental decrease in sonic booms associated with F-35A training under Scenario T1, T2, or T3 would result in a significant impact on wildlife.

Munitions Use and Defensive Countermeasures. The primary air-to-ground range available to Tucson AGS is the approximately 1.05 million acres at BMGR East. All ranges proposed for the use of live and inert munitions by the F-35A training currently support munitions use. Munitions use is restricted to specific designated target areas on ranges within BMGR, which are maintained in a mowed or bladed (bare ground) condition to minimize fire hazard. Target areas would not generally attract sensitive wildlife species because of limited habitat and resource availability, but sensitive species may occasionally occur there. Precautionary measures already in place at BMGR include monitoring for Sonoran pronghorn presence prior to activities at the tactical and manned ranges, noting approximate locations of pronghorn detected from observation points, and generating a target closure list based on the coordinates and the type of ordnance.

In contrast to most other military jet aircraft, the F-35A would not deploy chaff as a defensive countermeasure against radar-guided missiles. It would deploy defensive flares to counter heat-seeking missiles, as do most other military jet aircraft. Residual materials from a deployed flare likely to reach the ground are listed in Table 2–11 and include a small square piece of plastic or nylon, a small square piece of silicon foam, a plastic spring device, and a strip of graphite material similar to duct tape. Should one of these items be encountered by a wild or domestic animal, the animal is not expected to consume it or otherwise be affected by it. Generally, the duration of a flare burn is a few seconds and the flare burns out within a few hundred feet of its release altitude. In the event a flare were to reach the ground while still burning, it could ignite dry vegetation and start a wildland fire. Because of this, in fire-prone areas, special restrictions on flare use may be instituted to minimize the potential for a burning flare to reach the ground. Risks of starting a fire remain extremely small because the minimum altitude for flare deployment remains designated above 2,000 feet AGL and restrictions on flare use in extreme fire conditions continue to be established by a Command or base to reduce fire risks further. Flare use would be restricted to any authorized airspace where flare use is currently permitted. Restricting flare use to authorized airspace and altitudes reduces the potential for wildland fire ignition and spread. The potential for wildland fire in Lower Sonoran Life Zone ecosystems has historically been very low because the native vegetation was too sparse to carry fire. Recent spread of invasive nonnative grasses (such as buffelgrass) has increased the frequency of fire, which can kill creosotebush and some of the other dominant desertscrub species outright. At higher elevations, periodic wildland fire is a regular occurrence in desert grassland ecosystems, and the vegetation and wildlife species are well-adapted to periodic fire, having mechanisms to escape and survive fire and to regenerate after fire. It is unlikely that flare use associated with the F-35A training would appreciably increase the incidence of wildland fires given measures implemented to reduce the potential for fire from flare use; therefore, impacts on vegetation and wildlife would be less than significant. Additional details on flares are presented in Chapter 2, Section 2.4.5.

Bird–aircraft or other wildlife–aircraft collisions would occur infrequently and would not represent a substantial source of mortality for any species.

Auxiliary Airfield

Libby AAF. No construction or other modification associated with F-35A training is expected at Libby AAF. Existing annual airfield operations by military and civilian aircraft total 56,256 (see Table TU 2.2–4). Implementation of F-35A training would add between 11,143 and 33,427 airfield operations per year, depending upon the scenario, representing an increase of 20 to 59 percent above baseline levels. Due to Libby AAF's long history as an airfield and its ongoing level of activity, wildlife species in the vicinity of Libby AAF are not expected to be adversely affected by changes in aircraft overflight and noise associated with transitioning to the F-35A aircraft.

TU 3.7 Wetlands and Aquatic Communities

TU 3.7.1 Base

TU 3.7.1.1 Base Affected Environment

No federally designated wetlands have been identified at Tucson AGS or TUS (Arizona ANG 2003). Due primarily to the aridity of the location, coupled with topographic and soil characteristics, Tucson AGS does not support wetlands or the soil and hydrology characteristics likely to support establishment of wetlands.

Airport Wash is an ephemeral drainage that delineates the northern and eastern boundaries of Tucson AGS (Arizona ANG 2003). This wash is a tributary to the Santa Cruz River that carries surface runoff from Tucson AGS through a series of storm drains that flow north and northwest. As an ephemeral wash in this desert region, Airport Wash does not support aquatic communities.

TU 3.7.1.2 Base Environmental Consequences

No wetlands or aquatic communities would be within the construction zones where they could be directly affected by construction. Measures to control erosion, siltation, and fugitive dust would be included as part of the project implementation, minimizing the potential for construction to indirectly affect offsite aquatic and wetland habitats and biota. No effects on aquatic and wetland habitats are expected from F-35A operations in the vicinity of Tucson AGS.

TU 3.7.2 Airspace

TU 3.7.2.1 Airspace Affected Environment

The great species richness in desert riparian and wetland areas underscores the importance of these habitats despite their limited areal extent. Surface-water resources underneath the airspace are very limited and not fully mappable at the scale of the Arizona Game and Fish Department (AZGFD) GIS data used for this analysis. In the western portion of the airspace, primarily the Arizona–Mexico border region, the presence of surface water is typically

dependent on the season and recent precipitation events, usually occur in winter and summer. Reliable surface water is otherwise scarce in the region and tends to be associated with catchments, including natural rock depressions (referred to as "tinajas"), sand tanks (saturated sand depressions), charcos (pools within adobe flats and washes), playas (closed basin drainages), and/or springs and seeps. The eastern portion of airspace overlies the more-perennial sources of water in the San Francisco River and major forks of the Gila River. GIS data identified only 9,431 acres (less than 1 percent) of habitats labeled "playas" under the airspace (TNC 2004). Although there are few federally designated wetlands, most of the intermittent surface drainages in the ROI are considered jurisdictional waters of the United States and are therefore subject to the Clean Water Act (Air Force 1998).

Most desert species use riparian areas at some time during their life histories, whether for breeding, cover, food foraging, or shade during high temperatures. Some riparian areas have sufficient water availability to support trees, including Arizona sycamore (*Platanus wrightii*), Arizona walnut (*Juglans major*), narrowleaf cottonwood (*Populus angustifolia*), and willow (*Salix* spp.) as overstory. Deciduous riparian forests such as these may occur from the Lower Sonoran up to the higher-elevation Canadian Life Zones but occur on too small a scale to be included in vegetation community mapping. Riparian habitat shrubs include southwestern chokecherry (*Prunus serotina virens*), box elder, and Rocky Mountain maple (*Acer glabrum*).

Most of the arroyos and ephemeral stream channels dispersed throughout the areas underlying project airspace have the potential to support flow during and immediately following storm events; however, these drainages typically exist in a dry condition (Ogden 1998). In the southwesternmost part of the airspace (western portions of BMGR), it is so hot and dry that desertscrub vegetation at the lower elevations tends to be concentrated along intermittent drainages, which are lined with small trees (blue palo verde, desert ironwood), shrubs and subshrubs, and a variety of cacti, with areas between washes being almost devoid of vegetation.

Auxiliary Airfield

Libby AAF. Libby AAF at Fort Huachuca does not support abundant wetland habitats. According to a February 2000 wetland inventory performed by the U.S. Fish and Wildlife Service (USFWS), Fort Huachuca has a total of 63.9 acres of wetlands and 770.2 acres of riparian habitat (Arizona ANG 2008). However, none of these wetlands or riparian habitat are present on the Arizona ANG complex property where Libby AAF is located.

No surface-water bodies occur at Fort Huachuca. Surface-water features in Fort Huachuca are typically ephemeral streams consisting of dry washes, arroyos, or continuous and discontinuous gullies (Arizona ANG 2008). The ephemeral streams are narrow channels with a sand and gravel layer at the bottom of the channel, and only flow in response to precipitation events that are significant enough to achieve runoff conditions.

TU 3.7.2.2 Airspace Environmental Consequences

No adverse effects on aquatic and wetland habitats are expected from F-35A training operations in project airspace. There is a very low probability that an unburned flare or material from a flare would reach an aquatic or wetland environment. Magnesium, the major chemical component of flares, can be toxic at extremely high levels, a situation that could occur only under repeated and concentrated use in localized areas, which would not occur because of the

widely dispersed nature of flare deployment and the near absence of perennial surface waters. No adverse effects on aquatic and wetland habitats are expected from F-35A training use of Libby AAF as an auxiliary airfield because no ground disturbance would occur.

TU 3.8 Threatened, Endangered, and Special Status Species

USFWS maintains the list of species protected under the Endangered Species Act (ESA) (16 *United States Code* [U.S.C.] 1536). In addition, AZGFD compiles its own list of species considered threatened and endangered in Arizona. Under the Arizona Native Plant Law (*Arizona Revised Statutes* [ARS] Title 3, Chapter 7, "Arizona Native Plants"), protected native plants cannot be removed from any Arizona land without the permission of the landowner and a permit from the Arizona Department of Agriculture. Lessees of Federal and state land must obtain specific authorization from the landowner to remove protected native plants (AZDA 2010). Plants that fall under this law typically have value in landscaping and as ornamentals or collector's items and include the saguaro, hedgehog cactus, pincushion cactus, and numerous others.

TU 3.8.1 Base

TU 3.8.1.1 Base Affected Environment

There are no federally listed threatened or endangered species that are known or expected to occur at Tucson AGS (Arizona ANG 2003). In addition, due to the highly developed landscape of Tucson AGS, frequent noise disturbance of aircraft and human presence, and surrounding populated areas, no suitable habitat is likely present for these species.

TU 3.8.1.2 Base Environmental Consequences

No known federally listed threatened or endangered wildlife species or their habitats occur on Tucson AGS; therefore, no adverse effects on federally listed wildlife are anticipated from implementation of the F-35A aircraft scenarios at Tucson AGS. Because the proposed construction areas on Tucson AGS are located in previously disturbed areas, no significant impacts on other sensitive species that may occur on base would result from proposed construction of project facilities. Should state species of concern be detected at Tucson AGS where construction would occur, appropriate consultation with AZGFD would be undertaken and measures to avoid potential adverse impacts on the species would be conducted.

To comply with the Arizona Native Plant Law to protect native plants, surveys should be conducted at the site of any proposed ground-disturbing action on Tucson AGS to determine the presence or absence of federally or state-protected plants. The Arizona Department of Agriculture will conduct these surveys at no cost to the Air Force (Air Force 2006). If protected native plants are present in areas to be developed, it is recommended that they be considered for use in revegetating disturbed areas on Tucson AGS following construction.

No significant impacts from airfield operations would be expected on special status wildlife that may occur on base due to the qualitatively similar nature of F-35A operations to current and historical operations associated with the existing military airfield environment at Tucson AGS.

TU 3.8.2 Airspace

TU 3.8.2.1 Airspace Affected Environment

As part of the environmental impact analysis process for this project, USFWS and AZGFD were contacted for information on species of concern in the project area. Federally listed threatened and endangered species that are known or likely to occur in the areas underlying the project airspace are presented in Table TU 3.8–1. Since use of occasional use airspace and occasional use MTRs by F-35A is expected to be incidental and minor compared to the proposed use of primary use airspace by F-35A, use of occasional use airspace and MTRs is not evaluated further in this document.

Species that occur under the project airspace have been exposed to past and ongoing military overflights similar to those being proposed for this project. Because the project area is currently used airspace, many investigations into sensitive species have been conducted. Designated critical habitat for three listed fish, the endangered razorback sucker, threatened spikedace, and endangered Gila chub, occurs primarily in the Gila and San Pedro Rivers that flow under proposed project airspace.

Considering the nature of the proposed uses of the project airspace, no effects are anticipated on the fish or plant species listed in Table TU 3.8–1 or their associated habitats. For this reason, further discussion of these fish and plant species is not included. Species that could possibly be affected by the proposed project actions include birds, bats, reptiles, and large mammals at sensitive life stages (such as during breeding or during severe drought). These species are discussed in more detail below.

Table TU 3.8–1. Federally Listed, Proposed, and Candidate Species Known or Likely to Occur Under Primary Use Airspace and on Ranges

Common Name *(Scientific Name)*	*Federal Status*	*Jackal*	*Sells*	*Outlaw*	*Reserve*	*Morenci*	*Ruby*	*Tombstone*	*BMGR Ranges (including R-2301E)*	*VR-263*	*Libby AAF*
Mexican gray wolf *(Canis lupus baileyi)*	E/ NE				X	X					
Lesser long-nosed bat *(Leptonycteris curasoae yerbabuenae)*	E		X				X	X	X	X	X
Sonoran pronghorn *(Antilocapra americana sonoriensis)*	E								X (R-2301E)		
Masked bobwhite *(Colinus virginianus ridgewayi)*	E						X				
Northern aplomado falcon *(Falco femoralis septentrionalis)*	E; E/ NE						X	X		X	X!
Southwestern willow flycatcher *(Empidonax traillii extimus)*	E	X	X	X+	X+	X	X	X		X+	
Yuma clapper rail *(Rallus longirostris yumanensis)*	E		X								
Mexican spotted owl *(Strix occidnetialis lucida)*	T	X+	X	X+	X+	X+	X+	X+		X+	
Yellow-billed cuckoo *(Coccyzus americanus occidentalis)* Western Distinct Population Segment	C	X		X	X	X	X	X		X?	
Tucson shovel-nosed snake *(Chionactis occipitalis klauberi)*	C		X*	X*							
Sonoran desert tortoise (*Gopherus agassizii=G. morafkai*)	C	X	X	X			X		X	X	
Razorback sucker *(Xyrauchen texanus)*	E	X+		X+		X+				X+	
Spikedace *(Meda fulgida)*	T	X+		X+						X+	
Gila chub *(Gila intermedia)*	E	X+		X+	X+	X+				X+	
Pima pineapple cactus *(Coryphantha scheeri* var. *robustispina)*	E		X				X				

Key: C=candidate species for listing under the ESA; E=listed as endangered under the ESA; E/NE=experimental/ nonessential (reintroduced); T=listed as threatened under the ESA; X*=historic range of the species, current range much diminished; X+=USFWS-designated critical habitat present on lands beneath this airspace; X!=suitable habitat exists, potential reintroduction area; X?=unknown species presence in the airspace unit.

Source: Air Force 2009a; Arizona ANG 2003; AZGFD 2004b; USFWS 2008a, 2008b, 2008c, 2009a, 2010a, 2010b, 2010c, 2010d.

Mexican Gray Wolf. The Mexican wolf (a subspecies of the gray wolf) once roamed throughout vast portions of Arizona, New Mexico, Texas, and Mexico. But, as human settlement intensified across the southwestern United States in the early 1900s, wolves increasingly came into conflict with livestock operations and other human activities (USFWS 2010a). Federal, state, and private extermination campaigns were waged against the wolf until, by the 1970s, the Mexican wolf had been all but eliminated from the United States and Mexico. The Mexican wolf subspecies was listed as endangered under the ESA in 1973, and in 1978 the entire gray wolf species (outside of Minnesota and Alaska) was included under the

endangered listing. The United States and Mexico agreed to establish a bi-national captive breeding program with several wolves trapped in Mexico between 1977 and 1980 (USFWS 2010a). USFWS approved the Mexican Gray Wolf Recovery Plan in 1982 and in 1998, captivity-reared Mexican wolves were released to the wild for the first time in the Blue Range Wolf Recovery Area, which includes habitat under two proposed project MOAs. Many alterations to regional listings and de-listings have occurred with regard to this the species in the last couple years due to its controversial nature and the completion of state management plans.

Lesser Long-Nosed Bat. The lesser long-nosed bat was federally listed as endangered in 1988. Its range extends from southwestern New Mexico, through southern and central Arizona, into western Mexico. This species is present in Arizona from April through October and migrates to Mexico in the winter months. This bat feeds on nectar and pollen at night, primarily that of columnar cacti (such as saguaro) and agave species. Lesser long-nosed bats roost in mines and natural caves during the daylight hours. Threats to the species include loss or disturbance of roosts and maternity sites and loss of sufficient agave populations (Arizona ANG 2003).

Sonoran Pronghorn. This is one of five recognized subspecies of pronghorn found in North America and the only one listed (as endangered) under the ESA. The historic distribution of the Sonoran pronghorn is not definitively known because the population and range of the species had already suffered significant declines before it was recognized as a distinct subspecies in 1945. This subspecies is associated with Sonoran desertscrub habitats, which are declining as the result of vegetation conversion for farming, irrigation, livestock grazing, development of urban areas and roads, and the loss of vital riparian corridors (USMC 2001). The present distribution of the Sonoran pronghorn is limited to portions of BMGR and the adjacent state of Sonora, Mexico. Sonoran pronghorn population numbers in the United States have fluctuated due to several factors, showing a declining trend from a high of 282 in 1994 to a low of 21 in 2002 following extreme drought (Air Force 2009a). A captive breeding program was initiated in 2004 in the United States with the cooperation of Mexico to ensure genetic diversity. USFWS drafted an environmental assessment to establish a second U.S. population of endangered Sonoran pronghorn and identified Kofa NWR in Yuma County as its preferred reintroduction location (USFWS 2008d). The NWR was established in large part for the protection of desert bighorn sheep (*Ovis canadensis nelsonii*).

Northern Aplomado Falcon. Populations of the northern aplomado falcon were nearly extirpated in the United States by the 1950s. This species occurs almost exclusively in the Chihuahuan Desert of southern New Mexico, Arizona, and western Texas. Recently, the Air Force has worked with USFWS on the reintroduction of northern aplomado falcons into southern New Mexico and Arizona with the purpose of establishing a viable resident population. The reintroduced populations are designated by USFWS as experimental/nonessential in New Mexico and Arizona according to Section 10(j) of the ESA of 1973, as amended. Aplomado falcon populations have been successfully reintroduced to New Mexico and Texas. Suitable habitat and historical range exists around Fort Huachuca (the site of Libby AAF). USFWS does not expect conflicts between falcon management and agricultural, oil and gas development, military, or recreational activities in the area (WSMR 2002).

Southwestern Willow Flycatcher (SWFL). Willow flycatchers (*Empidonax traillii*) are fairly common throughout the southwest during migration, but the endangered southwestern willow flycatcher subspecies (*E.t.* ssp. *extimus*) breeds only in a few scattered drainages across seven southwestern states in healthy stands of dense riparian forests, habitats that have been much diminished from historical occurrences. USFWS-designated critical habitat occurs along narrow bands that follow the largest remaining river courses in the arid region, including, primarily, the Gila and San Pedro Rivers under project airspace. An analysis of proposed airspace units determined that approximately 29,754 acres of southwestern willow flycatcher critical habitat occurs under the airspace units listed in Table TU 3.8–1.

Mexican Spotted Owl. The Mexican spotted owl (MSO) (ESA-listed as threatened) typically nests and roosts in closed-canopy, old-growth montane coniferous forests or rocky canyons. MSOs may also nest on cliff ledges, in caves, in stick nests built by other birds, on debris platforms in trees, and in tree cavities. Federally designated critical habitat for the MSO occurs in patches within the forested regions of eastern and central Arizona. Stand-replacing wildfire is considered the greatest current threat to the species (USFWS 2011) and is related to forest management practices. Primary constituent elements of the critical habitat relate to forest structure, maintenance of adequate prey species, and canyon habitat (USFWS 2011). MSO critical habitat is very localized under the airspace. A GIS analysis overlaying critical habitat with proposed project airspace revealed that approximately 1,525,754 acres of spotted owl critical habitat polygons occur beneath several airspace units listed in Table TU 3.8–1, primarily associated with Apache, Gila, and Coronado national forests.

Western Population of the Yellow-Billed Cuckoo. The two subspecies of yellow-billed cuckoo (eastern and western) are considered geographically separated by the Continental Divide (USFWS 2009b). The western Distinct Population Segment (DPS) of the yellow-billed cuckoo was accepted as a candidate species under the ESA in 2001. Western yellow-billed cuckoos are migrants that prefer open woodlands with clearings and thick, scrubby undergrowth along watercourses (USFWS 2009b). Nesting occurs almost exclusively close to water with a canopy cover of at least 50 percent in both the understory and overstory. Due to extensive riparian habitat loss from changes in flow regimes of the major rivers, the overall range of the western yellow-billed cuckoo has decreased dramatically (USFWS 2009b). Its known occurrences in Arizona are along the Bill Williams River, along the Colorado River mainstem, and along the other major tributaries to the Gila, Salt, San Pedro, and Santa Cruz Rivers.

Masked Bobwhite. Extirpated from the United States around 1900, a refuge population with captive rearing of this quail species was established in 1985 at Buenos Aires NWR in the southern Altar Valley in Pima County, Arizona. This NWR occurs under the Ruby MOA. In 1996, the Buenos Aires NWR masked bobwhite population was estimated at 300 to 500. Three very small natural populations still persist in central Sonora, Mexico, consisting of fewer than 1,000 individuals, and reintroduction efforts are occurring there (USFWS 2010b).

Yuma Clapper Rail. The U.S. breeding population of Yuma clapper rails is non-migratory (resident); some birds may winter in Mexico. This secretive marsh bird's preferred habitats are freshwater marshes containing dense stands of cattails (*Typha latifolia*) and bulrushes (*Scirpus acutus*) (NatureServe 2010). This rail nests among mature stands of emergent vegetation along margins of freshwater and alkali shallow ponds and marshes with stable water levels.

Distribution in Arizona for this species has been mapped to include one known site under the Sells MOA on the Mexican border under the project ROI (AZGFD 2010).

Tucson Shovel-Nosed Snake. The Tucson shovel-nosed snake is a small burrowing species that preys on insects and other invertebrates. It inhabits sandy soils, where it uses "sand swimming" as its primary locomotion. It is primarily active between dusk and dawn, although it may be active in the morning and just before sunset. The distribution of this subspecies historically included portions of Pima, western Pinal, and a portion of eastern Maricopa counties (USFWS 2010c). Much of its original range has been converted to urban development or agriculture. The remaining distribution is believed to be primarily in the corridor between the Tucson and Phoenix metropolitan areas (USFWS 2010c). The principal threats to the species include continued loss of habitat to human development, road construction, maintenance and use, and wildfire associated with the spread of invasive, nonnative grasses (USFWS 2010c).

Sonoran Desert Tortoise/Morafka's Desert Tortoise. As of June 2011, Morafka's desert tortoise (*Gopherus morafkai*) was named, encompassing desert tortoise populations in Arizona and Sonora and separating them from Agassiz's desert tortoise (*Gopherus agassizii*) populations occurring in California, Nevada, and Utah. This newly named entity had been previously referred to as the "Sonoran population of the desert tortoise" or "Sonoran desert tortoise." The Sonoran desert tortoise was made a candidate species on December 14, 2010 (USFWS 2010d). The Mojave Desert Distinct Population Segment of *Gopherus agassizii* that occurs in California, Nevada, and Utah is listed as threatened under the ESA. Morafka's desert tortoise (*Gopherus morafkai*) currently has no federal status but is considered a species of greatest conservation need under Arizona's Comprehensive Wildlife Conservation Strategy: 2005–2015, completed by AZGFD (AZGFD 2006). The Draft Desert Tortoise Recovery Plan Revision (USFWS 2008e) also determined that, because there are only minor visual differences between the animals in the Mojave and Sonoran populations, the Sonoran population (Morafka's) also warranted protection as a threatened species under Section 4(e) of the ESA (similarity of appearance). Morafka's desert tortoise is found primarily on rocky slopes and bajadas of Sonoran desertscrub vegetation communities. These tortoises hide and burrow under rock crevices, in caliche caves and in incised, cut banks of washes (arroyos), especially in the Lower Colorado River Valley subdivision. Desert tortoises have been confirmed in several mountainous locations on BMGR East. BLM has designated and categorized essential and nonessential suitable habitat for Sonoran desert tortoise under the BMGR, Sells, Ruby, Outlaw, and a small portion of Jackal MOAs and under R-2301E and a small portion of VR-263.

Auxiliary Airfield

Libby AAF. Similar to conditions at Tucson AGS, Libby AAF is an active airfield with frequent noise and human presence. One endangered bat species, the lesser long-nosed bat, is known to occur on the Arizona ANG complex where Libby AAF is located (Arizona ANG 2008). The habitat around Libby AAF was once suitable for the northern aplomado falcon, although it is not known to be recently present (see earlier discussion within this section for more details on this species).

TU 3.8.2.2 Airspace Environmental Consequences

The potential for adverse effects of F-35A training in the airspace and at the auxiliary airfields on endangered, threatened, or special status wildlife is minimal, as described above for vegetation and wildlife (see Section TU 3.1.2.3). Because effects on a single individual of a federally listed endangered or threatened species could be significant, however, a more-detailed consideration of impacts is required for these species. In the analysis that follows, the focus is on the activities of the aircraft in airspace overlying habitat that may be occupied by endangered or threatened species and a comparison with existing conditions, including aircraft activity in the same locations. This is followed by a species-by-species synopsis of potential effects.

All F-35A flight activities would take place in existing airspace; therefore, no airspace modifications would be required. Activities required for the F-35A on training ranges and in airspace would be similar to existing use by F-16s, which would be replaced by the F-35As. Proportionately more of the F-35A sorties would occur at higher altitudes than F-16 sorties, which is expected to reduce the potential to startle wildlife and domestic animals with noise and the sudden appearance of overflying aircraft in low-level flight (i.e., below 1,000 feet AGL). Table TU 2.2–3 provides a comparison of altitude use between A-10 and F-16, which currently use the airspace, and F-35A aircraft. Only 15 percent of F-35A flight hours would be below 10,000 feet AGL, whereas 96 percent and 56 percent of the flight hours of A-10s and F-16s, respectively, would be spent below 10,000 feet AGL. At the altitudes where the F-35A would spend most of its time, overflight noise (as perceived from the ground) would increase relatively gradually from ambient to the peak noise level. Overflight events at these altitudes would not be expected to be startling to animals or to have other adverse impacts. Guided munitions used for F-35A training would be expected to be released from higher altitudes than conventional munitions employed by existing aircraft using the training ranges. Their use would be confined to existing target areas within existing restricted airspace.

The F-35A would conduct supersonic training in airspace units and at altitudes that are currently approved for supersonic training. Supersonic flight is authorized only in the Sells MOA/ATCAA at or above 10,000 feet MSL and in R-2301E at 5,000 feet AGL or above (see Table TU 2.2–1). Supersonic flight is not authorized on MTRs. Sonic booms generated by F-35A aircraft are expected to be similar in terms of overpressure and frequency of boom events per sortie to ongoing supersonic flight by F-16 aircraft. The addition of F-35A supersonic operations would be offset by decreases in F-16 supersonic operations. CDNL and the projected average number of sonic booms per day would decrease under all scenarios beneath the airspace units where supersonic flight is authorized (Sells MOA/ATCAA and adjacent portions of BMGR; see Table TU 3.2–4), and would average less than one projected sonic boom per day.

Table TU 3.8–2 provides a species-specific assessment of potential effects on endangered, threatened, and sensitive species in the ROI.

Table TU 3.8–2. Potential Effects on Federally Listed, Proposed, and Candidate Species That May Occur Under Primary Use Airspace and on Ranges

Species[1]	*Potential Presence in Project ROI*	*Potential Adverse Effects*
Mexican gray wolf	Widely dispersed in remote areas on national forest lands under the airspace at the Arizona–New Mexico border.	The Mexican gray wolf was reintroduced to remote, forested areas near the Arizona–New Mexico border, and these populations are designated by USFWS as experimental/nonessential (N/NE) populations. Under E/NE status, no formal ESA Section 7 consultation is required regarding potential impacts of land uses on these populations. Overflight by F-35A aircraft would represent a minimal departure from baseline conditions and is not expected to adversely affect the Mexican gray wolf or its habitat under the airspace.
Lesser long-nosed bat	Likely occurs on BMGR and under airspace where it is present during the late spring/summer flowering season of columnar cacti and agaves, which it pollinates.	Low potential for effect on nighttime foraging within the airspace. These bats are unlikely to be in the vicinity of the airfields at Tucson AGS, and those that are known to occur on Libby AAF are accustomed to air traffic and are unlikely to be adversely affected by the change on aircraft type. Minimal potential for effect during daytime, when the bats are roosting underground.
Sonoran pronghorn	On BMGR.	Low-level overflight with F-35A would be considerably less frequent than for existing aircraft currently using the airspace. Inexperienced animals may initially react behaviorally to sonic booms or low-level overflights, but would not reach the scale at which take would occur. Species conservation and impact minimization measures are already in place for Sonoran pronghorn at BMGR (USFWS 2010e). These include biological monitoring of Sonoran pronghorn prior to activities at the tactical and manned ranges; noting approximate locations of pronghorn detected from observation points and generating a target closure list based on the coordinates and the type of ordnance. Conservation measures for Sonoran pronghorn recovery actions supported annually by the Air Force include radio collaring; aerial telemetry flights; studies of diet, habitat use and genetics; forage enhancement; and a captive breeding project (USFWS 2010e).
Masked bobwhite	Limited range outside boundary of Sells MOA and therefore not under regularly used airspace.	Very low to no potential for effect.
Northern aplomado falcon	Sparse recovery populations under airspace and MTRs.	Similar to the Mexican gray wolf above, this species was reintroduced to limited, remote grassland habitats in southern New Mexico, Arizona, and Texas and has E/NE status with USFWS. Therefore, no formal ESA Section 7 consultation is required regarding potential impacts of land uses on these populations. Any occurrences near airfields where low-level flight would be most frequent would be extremely rare and incidental; therefore, the potential for a bird–aircraft strike is so low as to be discountable. No adverse effects on the northern aplomado falcon or its habitat from F-35A training associated with the F-35A beddown are expected.

Species[1]	***Potential Presence in Project ROI***	***Potential Adverse Effects***
Southwestern willow flycatcher	Inhabits limited riparian habitats under airspace and MTRs.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions and slight changes in the noise environment are not expected to adversely affect the southwestern willow flycatcher. Its preferred habitat of thick, riparian canopy cover is expected to minimize or eliminate any visual appearance of an overflying aircraft. Based on these results, overflight by F-35A aircraft is not expected to reach the scale at which take would occur. The potential for a bird–aircraft strike is so low as to be discountable.
Yuma clapper rail	Small, localized populations associated with marshes on the Colorado, Gila, Salt, and Verde Rivers primarily not under the airspace.	Very low to no potential for effect.
Mexican spotted owl	Limited, specific habitat located in montane forest and canyons under MOAs and VR-263.	The potential for overflight impacts on the Mexican spotted owl (MSO) have been studied in some detail. MSO did not flush from a nest or perch unless a helicopter was as close as 330 feet (Delaney et al. 1997). F-16 overflights produced minimal responses at elevations of about 2,000 feet above MSOs (Johnson and Reynolds 2002). It was also noted that MSO responses to the F-16 overflights were often less than responses to naturally occurring events such as thunderstorms. A 6-year study conducted by Air Combat Command (ACC) found that aircraft overflights had no effect on occupancy of MSO activity centers and found no correlations among measures of aircraft exposure and nesting success (ACC 2008). Additionally, no flushing or loss of adults or young was observed in response to any aircraft overflights, including 40 observations of military jet aircraft overflight that came within 500 feet of owls. Use of primary project airspace by F-35As would not be below 500 feet AGL and most use would be at much higher altitudes (93 percent above 5,000 feet AGL). Based on the study results and the proposed airspace use, overflight by F-35A aircraft is not expected to reach the scale at which take would occur. In addition, the chance of accidental bird–aircraft strike is so unlikely as to be discountable. Use of defensive flares is not authorized below 2,000 feet AGL and no use of flares is authorized on MTRs; therefore, the project would not adversely modify MSO critical habitat or its primary constituent elements.
Yellow-billed cuckoo (Western DPS)	Limited range along riparian habitats under airspace.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions and slight changes in the noise environment are not expected to adversely affect the yellow-billed cuckoo. Its preferred habitat of thick, riparian canopy cover is expected to minimize or eliminate any visual appearance of an overflying aircraft. The potential for a bird–aircraft strike is so low as to be discountable. No adverse effects from the F-35A beddown are expected.
Tucson shovel-nosed snake	Possible occurrence under airspace.	Introduction of the F-35A aircraft would represent a minimal departure from baseline conditions for this species; slight changes in the noise environment are not expected to be perceptible to or to adversely affect the Tucson shovel-nosed snake. An individual's response, if any, to overflight would most likely be to "freeze" (i.e., become immobile) momentarily without any harm to the individual. Burrowing habits and activity of the species primarily between dusk and dawn would minimize the exposure of the species to overflight.

Species[1]	*Potential Presence in Project ROI*	*Potential Adverse Effects*
Sonoran desert tortoise/Morafka's desert tortoise	Potential occurrence in Sonoran Desert habitats under the airspace.	Introduction of the F-35A aircraft would represent a minimal departure from existing conditions, and slight changes in the noise environment are not expected to adversely affect the Sonoran desert tortoise/Morafka's desert tortoise. A comprehensive study of effects of low-level jet overflights on desert tortoises demonstrated no acoustic startle response or voiding of urine and no damage to hearing under overflight and sonic boom conditions typical of military operations areas (Bowles et al. 1999). Temporary "freezing" (i.e., remaining immobile), a typical reptilian defensive response, was noted after initial exposure to intense overflight noise, but the response diminished dramatically with subsequent exposure, indicating habituation. Given the existing exposure of tortoises to low-level military jet overflight activity in the project airspace, habituation is likely. Low-level overflight with F-35A would be considerably less frequent than for aircraft currently using the airspace. Inexperienced animals may initially react behaviorally to sonic booms or low-level overflights, but the response would not reach the scale at which take occurs.

[1] See Table TU 3.8–1 for species status and additional information on distribution with respect to areas proposed for use for F-35A training.

In conclusion, although it is possible for a federally listed, proposed, or candidate wildlife species to exhibit a temporary response to a low-level overflight or sonic boom, such as assuming an alert posture, it is very unlikely that such a response would adversely affect the survival or fecundity of the affected individual or reach the scale at which "take" occurs (as defined in the ESA). The probability of a bird–aircraft strike involving injury to a listed, proposed, or candidate species is so low as to be discountable. Therefore, impacts of the project on listed, proposed, or candidate species and their habitat would be less than significant. These circumstances are consistent with "may affect, not likely to adversely affect" listed or proposed species and "would not adversely modify critical habitat" determinations under the ESA. In the event that Tucson AGS becomes the Preferred Alternative, the Air Force will submit these findings to USFWS and seek its concurrence with this determination in compliance with the ESA.

TU 3.9 Cultural Resources (Archaeological, Architectural, Traditional, Native American Consultation)

For purposes of compliance with Section 106 of the National Historic Preservation Act (NHPA) and in accordance with 36 CFR Section 800.4(a)(1), the area of potential effect (APE) under the Tucson AGS alternative has been defined. The APE for direct and indirect impacts is considered to be Tucson AGS, which comprises 94 acres, although actual potential construction impacts would involve a much smaller area (see Figure TU 2.1–2); Libby AAF, as shown in Figures TU 3.2–4 through TU 3.2–6; and the MOA/ATCAAs, MTRs, and Restricted Areas shown as primary use airspace in Figure TU 2.2–1. The definition of cultural resources and methodology for analysis are described in Chapter 3, Section 3.7.

TU 3.9.1 Base

TU 3.9.1.1 Base Affected Environment

Archaeological Resources. The 162 FW installation at Tucson AGS consists of 94 acres and 43 buildings/facilities, which have been surveyed for cultural resources (Arizona ANG 2010c). The program plan for the cultural resources survey prepared in 2010 stated that of the 94 acres that make up the 162 FW installation, approximately 90 acres are paved, developed, or highly disturbed, and previous Installation Restoration Program site investigations suggest that the areas surrounding the built environment are disturbed (Arizona ANG 2010c). No archaeological sites were discovered during the survey (Arizona ANG 2010c), although several prehistoric sites are known to exist within a mile of the airport.

Historic Architectural Resources. Twenty-three of the 43 buildings/facilities at the 162 FW base at Tucson AGS were built before the end of the Cold War. None of the buildings/facilities inventoried and evaluated for significance meet the criteria for listing in the National Register of Historic Place (NRHP) (Arizona ANG 2010c).

Traditional Cultural Resources and Native American Concerns. Tucson AGS is located approximately 4 miles east of San Xavier del Bac. A portion of the RPZ for Runway 03-21 is located within the San Xavier district of the Tohono O'odham Indian Reservation, approximately one-half mile southwest of the base. Other than the above-mentioned sites and properties, no significant cultural resources are known to exist in the vicinity of the 162 FW installation (Arizona ANG 2010c).

TU 3.9.1.2 Base Environmental Consequences

Scenario T1. Under this scenario, 24 F-35A aircraft would be bedded down at Tucson AGS. The F-16 training mission currently located at Tucson AGS would relocate, and the Netherlands F-16 training mission and the ANG/AATC would remain (see Table TU 2.0–1). Projected construction and renovation projects required under this scenario include construction of 16 new buildings or facilities, associated infrastructure, and additions or alterations to 1 building (the Squadron Operations Building) and 4 other structures (see Table TU 2.1–2).

Impacts on archaeological resources are not expected under this scenario. Construction of facilities would take place within the 94 acres of previously disturbed area of the military installation, which have very low probability of containing any intact cultural deposits (Arizona ANG 2010c).

There is always the possibility that previously unknown or unrecorded archaeological resources could be present beneath the ground surface, sometimes underneath existing development. In the event that previously unrecorded cultural resources are encountered during construction, Tucson AGS would manage these resources in accordance with Federal and state laws, as well as Air Force regulations.

Indirect impacts on archaeological resources at Tucson AGS due to personnel changes are not expected. Although the number of skilled personnel needed to operate and maintain the wing and provide necessary support services will increase, the on-base population will not increase.

Impacts on architectural resources would not occur under this scenario. Twenty-three buildings/facilities at Tucson AGS built before the end of the Cold War have been evaluated for historic significance and determined ineligible for listing in the NRHP. In compliance with Section 106 of the NHPA, the Air Force has completed consultation with the Arizona SHPO regarding potential impacts on historic properties, and received concurrence that basing the F-35A training mission at Tucson AGS will have no effect on historic properties (see Appendix C).

Impacts on traditional cultural resources are unlikely under this scenario, as no Native American traditional cultural properties (TCPs) or traditional cultural resources at the installation have been identified. However, there is always the possibility that previously unknown or unrecorded traditional cultural resources could be present beneath the ground surface, sometimes underneath existing development. In the event that previously unrecorded traditional cultural resources are encountered during construction, Tucson AGS would manage these resources in accordance with Federal and state laws, as well as Air Force regulations.

Scenario T2. Under this scenario, 48 F-35A aircraft would be bedded down at Tucson AGS. The F-16 training mission currently located at Tucson AGS and the Netherlands F-16 training mission would relocate. The ANG/AATC would remain in place at Tucson AGS and would continue to operate 6 F-16 PAA.

Projected construction and renovation projects required under this scenario would be similar to those described for Scenario T1 (see Table TU 2.1–2), with an additional renovation/addition to the Aircraft Maintenance Unit building. Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario T1, but with slightly more ground disturbance.

Scenario T3. Under this scenario, 72 F-35A aircraft would be bedded down at Tucson AGS, and the existing F-16 training mission changes would be the same as those under Scenario T2. Projected construction and renovation projects required for this scenario would be similar to those described for Scenario T1, with an additional renovation/addition to the Aircraft Maintenance Unit building and additional construction of aircraft maintenance hangars (see Table TU 2.1–2). Therefore, anticipated impacts on archaeological, historic architectural, and traditional cultural resources would be similar to those described for Scenario T1, but with slightly more ground disturbance.

TU 3.9.2 Airspace

TU 3.9.2.1 Airspace Affected Environment

The MOA, MTR, and range areas were used by Native Americans and European-American settlers. BMGR contains evidence of human settlements dating to 9500 BC. This evidence includes prehistoric pottery, pictographs, and ancient trails. There are many recorded archaeological sites found throughout the training area. An analysis of 440 archaeological sites at BMGR may be representative of the larger area (Arizona ANG 2003). This analysis found the majority of archaeological sites (45 percent) pertain to the Native American Ceramic Period; the Euroamerican Historic Period (22 percent) is next in abundance. The remaining sites were characterized as Prehistoric (16 percent), Archaic (4 percent), Modern (2 percent), and Unassignable (11 percent). Historic sites include abandoned mining operations; gravesites; and a historically significant road, the Camino del Diablo, which is listed in the NRHP.

Table TU 3.9–1 presents the NRHP-listed sites and Indian Reservation lands under the various blocks of training airspace associated with Tucson AGS. The Tucson AGS training airspace overlies at least part of eight counties in Arizona (Apache, Cochise, Gila, Graham, Greenlee, Pima, Pinal, and Santa Cruz) and one county in New Mexico (Catron). Tucson AGS airspace also overlies portions of the Tohono O'odham Nation and the Fort Apache and San Carlos Apache Indian Reservations. One hundred seventeen NRHP-listed properties have been identified under Tucson AGS primary use airspace for the F-35A (see Appendix C, Table C–12). In addition, many more eligible or potentially eligible cultural resources associated with the history of the region are likely to underlie airspace. Appendix C contains the NRHP-listed resources under Tucson AGS airspace.

Table TU 3.9–1. NRHP-Listed Sites and Indian Reservation Lands Under Tucson AGS Training Airspace

Airspace Designation	Number of NRHP Properties Under Airspace[1]	Indian Reservation Lands Under Airspace
Jackal MOA	31	San Carlos Indian Reservation, Fort Apache Indian Reservation
Outlaw MOA	31	San Carlos Indian Reservation
Ruby MOA	1	Tohono O'odham Indian Nation
Sells MOA	9	Tohono O'odham Indian Nation
Tombstone MOAs	25	None
Rustler Airspace	14	San Carlos Indian Reservation, Fort Apache Indian Reservation
Reserve MOA	7	San Carlos Indian Reservation, Fort Apache Indian Reservation
VR-263	5	None
R-2301E TAC Airspace (BMGR East)	1	None

[1] More-complete information concerning NRHP-listed properties, including property name and location (state, county, and nearest town), is found in Appendix C, Table C–12.

One hundred seventeen NRHP-listed properties have been identified under Tucson AGS primary use airspace for the F-35A. In addition, many more eligible or potentially eligible cultural resources associated with the history of the region are likely to underlie airspace. Appendix C contains the NRHP-listed resources under Tucson AGS airspace.

At least two traditional cultural resources, one TCP, and one sacred site, have been identified under Tucson AGS airspace (Luke AFB 2010). During the government-to-government

consultation with tribes, the Hopi Tribe stated that they consider the prehistoric archaeological sites of their ancestors to be TCPs. The exact location of all traditional cultural resources, whether listed or eligible for listing in the NRHP or not, is confidential.

Auxiliary Airfield

Libby AAF. Libby AAF is located on Fort Huachuca near Sierra Vista, Arizona, in Cochise County. Libby AAF is an active airfield with frequent noise, and there are no NRHP-listed properties there (NRIS 2010).

TU 3.9.2.2 Airspace Environmental Consequences

Scenario T1. Under this scenario, 24 F-35A aircraft would be bedded down at Tucson AGS and would train in the primary use airspace listed in Table TU 2.2–1 and described above. The F-16 training mission currently located at Tucson AGS would relocate, and the Netherlands F-16 training mission and the ANG/AATC would remain (see Table TU 2.0–1).

Projected airspace use under Scenario T1 would decrease from baseline conditions in most airspaces as a result of the decrease in F-16 sortie-operations, with the Tombstone MOA decreasing the most, at 57 percent fewer sorties than baseline conditions. The only increase would occur in the Jackal MOA, with a 7 percent increase over baseline conditions (see Tables TU 2.2–1 and TU 2.2–2). Subsonic noise would decrease or remain the same under all airspaces except the Ruby and Tombstone MOAs and VR-263, where it would remain below 65 dB DNL_{mr}. Supersonic events (sonic booms) are expected to decrease from two to three per day to less than one per day in all airspaces where supersonic flights occur.

No impacts on historic properties under airspace associated with Tucson AGS are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operations would be even less likely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-15, F-16, F-18, and A-10 aircraft has not impacted historic properties. Although there would be an increase in subsonic noise under Ruby MOA, Tombstone MOA, and VR-263, it would not be of sufficient magnitude to impact historic properties under airspace. F-35As will typically operate at higher altitudes than the legacy aircraft, and impacts on historic properties, including rock art, from noise and vibration are not expected. Flare and inert munitions use is not expected to impact historic properties under airspace. Existing use of flares by legacy aircraft is not known to have impacted these resources, and their use by F-35A aircraft also is not expected to result in impacts.

<u>Native American Concerns.</u> During the EIS public scoping process, the Air Force contacted the Tohono O'odham Nation, the Hualapai Tribe, Fort Mojave Indian Tribe, Salt River Pima-Maricopa Indian Community, and Yavapai-Apache Nation to invite them to attend the public meetings and express their concerns about the potential F-35A beddown at Tucson AGS. During the scoping process, including the public meetings, no comments regarding potential impacts on traditional cultural resources or TCPs were received.

In accordance with Section 106 of the NHPA and Executive Order 13175, the Air Force also has contacted the tribes listed in Appendix C to consult on a government-to-government basis regarding their concerns about potential impacts on traditional cultural resources and TCPs under the airspace associated with Tucson AGS. After sending letters by mail, contacting the tribes by telephone and email, and briefing tribes at regularly scheduled meetings, the Air Force has received responses from eight tribes as of December 2011. The Tohono O'odham Nation wrote expressing interest in the Air Force's action. The Gila River Indian Community wrote expressing concern over aircraft crash and recovery procedures' potential to impact archaeological sites and deferred to the Tohono O'odham Nation as the lead in future consultations. The Fort Yuma-Quechan Tribe, Cocopah Tribe, and Ak-Chin Indian Community deferred comments to the Tohono O'odham Nation. The Hopi Tribe responded in writing that they consider prehistoric archaeological resources TCPs and that unless additional surveys identify prehistoric cultural resources or any are inadvertently discovered, they would defer further consultation on the proposed project to the State Historic Preservation offices and other interested tribes and parties. The Navajo Nation, Kaibab Band of Paiute Indians, Chemehuevi Tribe, and the Mescalero Apache Tribe indicated that they have no concerns regarding the Air Force proposal.

Three Indian Reservations underlie airspace associated with Tucson AGS: parts of the Fort Apache and San Carlos Indian Reservations, and parts of the Tohono O'odham Nation (Figure TU 2.2–1). TCPs and other traditional cultural resources are known to underlie this airspace.

Any increase in subsonic noise under any airspace, as well as continued flare use, is not expected to result in impacts on traditional cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

Scenario T2. Under this scenario, 48 F-35A aircraft would be bedded down at Tucson AGS and would train in the primary use airspace listed in Table TU 2.2–1 and described above. The F-16 training mission currently located at Tucson AGS and the Netherlands F-16 training mission would relocate. The ANG/AATC would remain in place at Tucson AGS and would continue to operate 6 F-16 PAA. Projected airspace use under Scenario T2 would increase by between about 10 and 69 percent over baseline use in the Ruby, Outlaw, and Jackal MOAs and would decrease about 12 to 61 percent in the Sells, Rustler, Tombstone, R-2301E (BMGR) and VR-263 airspaces (see Tables TU 2.2–1 and TU 2.2–2). Subsonic noise would increase somewhat under the Ruby, Sells, and Tombstone MOA/ATCAAs and R-2301E (BMGR), but would remain at or below 62 dB DNL. Subsonic noise would increase to 59 dB DNL_{mr} under the centerline of VR-263. Supersonic events (sonic booms) are expected to decrease in all airspaces where supersonic flights occur, from two to three per day to less than one per day.

As under Scenario T1, no impacts on historic properties under airspace associated with Tucson AGS are expected under this scenario. Scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage (see Appendix B, Section B.2.10). Ongoing use of airspace by F-15, F-16, F-18, and A-10 aircraft has not impacted historic properties, and the incremental increase in noise is not

expected to impact historic properties under airspace. Flare and inert munitions use is not expected to impact historic properties under Tucson AGS airspace.

Native American Concerns. Native American concerns and tribal lands overflown are the same as those identified under Scenario T1 above. Under Scenario T2, the increase in subsonic noise under the primary use airspace, as well as continued flare use, is not expected to result in impacts on traditional cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

Scenario T3. Under this scenario, the existing F-16 training mission changes would be the same as for Scenario T2, and 72 F-35A aircraft would be bedded down at Tucson AGS and would train at the airspaces listed in Table TU 2.2–1 and described above.

Projected airspace use under Scenario T3 would increase by between about 71 and 137 percent over baseline use in the Jackal and Ruby MOAs and by 16 and 48 percent in the Outlaw and Rustler airspaces; airspace use would decrease by between 4 and 59 percent beneath Sells MOA/ATCAA R-2301E (BMGR) TAC ranges, and Tombstone MOA, and VR-263 (see Tables TU 2.2–1 and TU 2.2–2). Subsonic noise would increase somewhat under the Ruby, Sells, and Tombstone MOAs/ATCAAs and R-2301E (BMGR), but would remain at or below 65 dB DNL_{mr}. Subsonic noise would increase to 61 dB DNL_{mr} under the centerline of VR-263. Supersonic events (sonic booms) are expected to decrease slightly from two to three per day, to less than one per day.

No impacts on historic properties under airspace associated with Tucson AGS are expected under this scenario. As under Scenario T2, ongoing use of airspace by F-15, F-16, F-18, and A-10 aircraft has not impacted historic properties, and the incremental increase in noise, as well as flare and inert munitions use, is not expected to impact historic properties under airspace.

Native American Concerns. Native American concerns and tribal lands overflown are the same as those identified for Scenario T1 above.

Under Scenario T3, the increase in subsonic noise under the primary use airspace, as well as continued flare use, is not expected to result in impacts on traditional cultural resources, as none were identified by Native American groups during Air Force consultation with interested Native American groups regarding airspace actions.

TU 3.10 Land Use and Recreation

TU 3.10.1 Base

TU 3.10.1.1 Base Affected Environment

Land Use

Regulatory Setting. The following information addresses Federal, state, and local statutes, regulations, programs, and plans that are relevant to the analysis of land use for Tucson AGS and the surrounding areas. Because potential land use impacts are largely noise-related, the discussion of regulatory setting focuses on noise-related land use regulations and compatibility constraints.

Part 150 Noise Study. An overview of the Part 150 Noise Compatibility Program, developed under 14 CFR Part 150, is provided in Chapter 3, Section 3.8. The TUS Part 150 Noise Compatibility Program is intended to achieve compatibility between land uses at the airport and in surrounding communities. In particular, the Part 150 Program seeks to reasonably reduce impacts on surrounding communities from airport noise generated at TUS.

The original Part 150 Study for TUS was conducted in 1984 and updated in 1991. The *FAR Part 150 Noise Compatibility Program Update Tucson International Airport* includes airport noise exposure maps for 1990 through 1994 and an updated Noise Compatibility Program with recommendations to reduce the effects of aircraft noise on the people living and working in the airport environs (TAA 1991). The recommended noise mitigation measures are intended to reduce incompatible land uses through sound insulation of buildings, relocation of residents, and property redevelopment and to prevent the development of incompatible land uses through planning, zoning, acquiring undeveloped property, and informing property owners and the public of high noise areas. As discussed below, the City of Tucson and Pima County have adopted airport environs overlay districts within which local land use codes and zoning ordinances regulate land use compatibility in areas surrounding TUS. TUS is currently in the process of updating its Part 150 Study.

Base Plan. The *Arizona Air National Guard Tucson IAP Installation Development Plan* guides future development and land use decisions at Tucson AGS (Arizona ANG 2009).

Local Regulations and Ordinances. The City of Tucson and Pima County have regulations and ordinances that specifically address land use and zoning issues surrounding TUS. The City of Tucson Land Use Code establishes the Airport Environs Zone. The Airport Environs Zone consists of districts and zones, including a Compatible Use Zone, Noise Control Districts, and the Airport Hazard District. The Land Use Code outlines land use regulations that apply within each zone or district.

On-Base Land Use. TUS comprises approximately 5,530 acres adjacent to the city of Tucson in Pima County, Arizona. Tucson AGS occupies a roughly triangular 94-acre parcel on the northwestern portion of TUS pursuant to a Joint Use Agreement between the TAA and the U.S. Government. This agreement allows the ANG to lease and operate the installation, jointly

used flying facilities, and other government facilities located at TUS. The ANG shares use of the runway, security, navigational aids, and fire control with the airport.

Existing land use at Tucson AGS can be divided into four general categories: airfield and direct mission, industrial special categories, command and support, and open space. Most of the area is utilized for airfield and direct mission-related uses. Runways, taxiways, aprons, fuel storage areas, hangars, and aircraft maintenance areas are included in this category and occupy most of the southern portion. Industrial and special category areas compose most of the northern portion and include industrial uses, munitions and hazardous waste storage facilities, and small arms and fire training areas. Command and support facilities are separated into five distinct locations and include administrative, office space, medical, community, and recreational facilities.

Open space (i.e., designated wildlife and habitat conservation areas or other undeveloped or undisturbed areas that are not occupied by the other three uses) occurs along the western and southwestern base boundaries, in addition to the northernmost section of the base on both sides of Airport Wash (Arizona ANG 2003).

Surrounding Land Use. Tucson AGS is bordered on the north by Valencia Road and on the west, east, and south by TUS. Existing land use to the north of the base beyond Valencia Road and within the city of Tucson consists of residential, industrial, commercial, open/agricultural/ transportation, and public/quasi-public.

Under baseline conditions, land uses within the 65 dB DNL or greater noise contours primarily consist of open, commercial, industrial, and public/quasi-public (see Table TU 3.10–1 and Figure TU 3.10–1).

Table TU 3.10–1. Off-Base Land Uses within the Tucson AGS 65 dB DNL and Greater Noise Contours, Baseline Conditions

Contour Interval (dB DNL)	*Land Use (acres)*						
	Commercial	**Industrial**	**Open**	**Public/Quasi-Public**	**Recreational**	**Residential**	**Total Area Affected**
65–69	122	5	289	5	0	23	444
70–74	38	0	16	0	0	0	54
75–79	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0
≥ 85	0	0	0	0	0	0	0
Total Area	**160**	**5**	**305**	**5**	**0**	**23**	**498**

Source: Pima County Department of Transportation 2009.

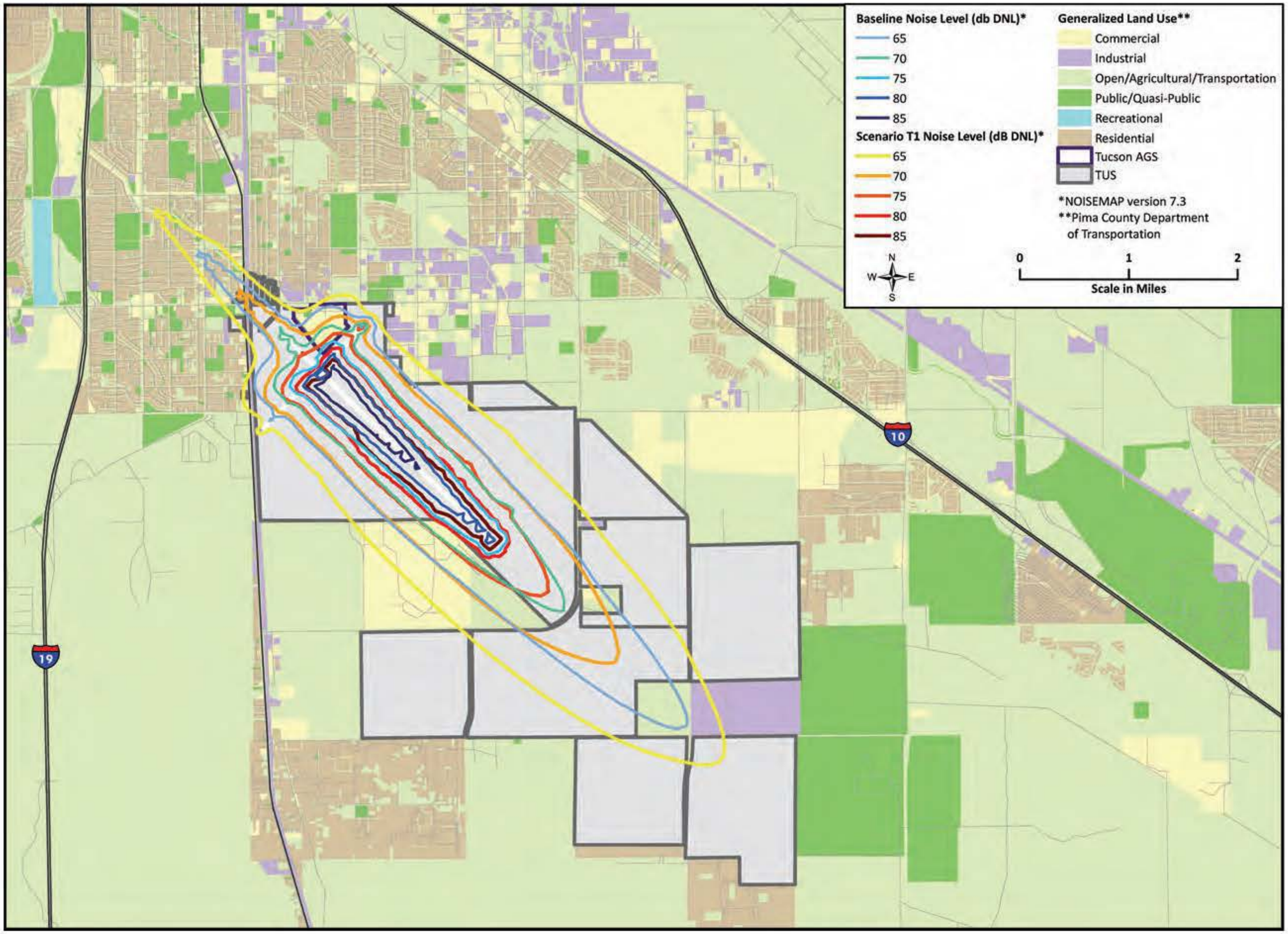


Figure TU 3.10–1. Scenario T1 and Baseline Land Use and Noise Contours in Areas Surrounding Tucson AGS

Recreation

Tucson AGS provides limited indoor recreational facilities for base personnel. The City of Tucson has an assortment of recreational amenities throughout the city, including parks with various features such as ramadas/shelters, pools, playgrounds, special occasion areas, barbecue areas, walking paths, off-leash dog areas, sports fields, play courts, and recreation and senior centers. Schools also provide outdoor playing fields and playgrounds for recreation. Table TU 3.10–2 lists the public recreational facilities around the airport and approximate noise levels at those sites currently. To the south, southeast, and southwest of the airfield, land is mostly open and undeveloped and there are no municipal recreational sites. A commercial speedway is located to the southeast near the Federal and state correctional facilities.

Table TU 3.10–2. Recreational Amenities Around Tucson International Airport

Recreational Amenity	*Activities*	*Current Noise Level (dB)*	*Compatibility (Y/N)*
Bravo Park	Sports fields, playground, play courts, walking path	< 65	Yes
Challenger Middle School	Sports fields and ball courts	< 65	Yes
Desert Vista Park	Walking path, recreation center	< 65	Yes
El Pueblo Park/Recreation Center	Ramada, barbecue pits, pool, playground, play courts, recreation center	< 65	Yes
Fiesta Park	Ramada, barbecue pits, pool, playground, play courts, recreation center	< 65	Yes
Mission Manor Park	Ramada, barbecue pits, play courts, horseshoe pit	< 65	Yes
Oaktree Park	Ramada, barbecue pits, sports fields, playground, recreation center	< 65	Yes
Pima County Rodeo Grounds and Park	Rodeo and parade ground with grandstand, playground, recreation center	< 65	Yes
Rodeo Wash Park		< 65	Yes
Sunnyside Park/High School	Ramada, barbecue pits, sports fields, pool, walking path, recreation center	< 65	Yes

Source: Tucson 2010.

TU 3.10.1.2 Base Environmental Consequences

Land Use

Scenario T1. The F-35A training beddown under Scenario T1 would require construction and modification of facilities within Tucson AGS (see Table TU 2.1–2). The construction, demolition, and renovation of facilities would take place within the previously disturbed cantonment area. Although the specific location of projected facilities is not yet known, the land uses on the installation are characteristic of a military airfield. New facilities would be designed and sited to be consistent with other installation functions, airfield safety guidelines, and related planning programs to ensure that projected development associated with F-35A training would be compatible with surrounding land uses. Land use impacts on surrounding communities during construction are expected to be minimal because proposed development would be contained within existing military designations at Tucson AGS. In addition, traffic, noise, dust, and similar effects from construction equipment and vehicles would be reduced through construction plans and practices agreed to by contractors.

As summarized in Table TU 3.10–3 and illustrated in Figure TU 3.10–1, activities under Scenario T1 would increase the area surrounding Tucson AGS within the 65 dB DNL or greater noise contour by approximately 701 acres compared with baseline conditions. This would result in an increase of approximately 1,512 off-installation residents affected by noise levels of 65 dB DNL or greater. Overall, acreage of commercial, industrial, open, public/quasi-public, and residential land uses under the 65 dB DNL or greater noise contours would increase. The largest increase in acreage would be commercial, followed by open space and industrial uses.

Scenario T2. The F-35A beddown of training aircraft under Scenario T2 would require slightly more construction and modification of facilities within Tucson AGS than Scenario T1 (see Table TU 2.1–2). Although the specific location of projected structures associated with F-35A training is not yet known, the siting and design of the structures are expected to follow existing patterns on Tucson AGS and would be consistent with other land uses and functions.

Activities under Scenario T2 would increase the area surrounding Tucson AGS within the 65 dB DNL or greater noise contour by approximately 1,442 acres compared with baseline conditions (see Table 3.10–3 and Figure TU 3.10–2). This would result in an increase of approximately 3,972 people affected by the 65 dB DNL or greater noise contours. Overall, acreage of commercial, industrial, open, public/quasi-public, and residential land uses under the 65 dB DNL or greater noise contours would increase. Recreational land use would not occur within the 65 dB DNL or greater noise contours. The largest increase in acreage would be open areas, followed by commercial, industrial, and other uses.

Scenario T3. The F-35A beddown of training aircraft under Scenario T3 would require construction and modification of facilities within Tucson AGS (see Table TU 2.1–2). Although the specific location of projected structures associated with F-35A training is not yet known, the siting and design of the structures are expected to follow existing patterns on Tucson AGS and would be consistent with other land uses and functions.

Activities under Scenario T3 would increase the area surrounding Tucson AGS within the 65 dB DNL or greater noise contour by approximately 2,439 acres compared with baseline conditions (see Table TU 3.10–3 and Figure TU 3.10–3). This would result in an increase of approximately 8,128 off-installation residents affected by the 65 dB DNL or greater noise contours. Overall, acreage of commercial, industrial, open, public/quasi-public, and residential land uses under the 65 dB DNL or greater noise contours would increase. Recreational land use would not occur within the 65 dB DNL or greater noise contours. The largest increase in acreage would be open areas, followed by commercial, industrial, and other uses.

Recreation

Scenario T1. Construction in support of the F-35A beddown would take place within the existing cantonment area. Surrounding parks, schools, and recreational facilities are too far from the installation to be affected by construction noise. Increased truck traffic to the installation during the 2-year construction period may cause temporary effects on traffic flow on local roads, but this should not interfere with access to recreational areas nearby. New facilities would not alter any sensitive views that have important recreational value.

Table TU 3.10–3. Off-Base Land Uses within the Tucson AGS 65 dB DNL and Greater Noise Contours, F-35A Beddown Scenarios

	Generalized Land Use (Off-Installation/Airport)													
	Commercial		**Industrial**		**Open**		**Public/Quasi-Public**		**Recreational**		**Residential**		**Total Area Affected**	
Contour Interval (dB DNL)	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**	**Acres**	**Change**
Scenario T1 (24 Aircraft)														
65–69	278	156	96	91	398	109	22	17	0	0	72	49	866	421
70–74	111	73	2	2	154	138	3	3	0	0	0	0	269	215
75–79	40	40	0	0	22	22	0	0	0	0	0	0	62	62
80–84	3	3	0	0	0	0	0	0	0	0	0	0	3	3
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**432**	**272**	**98**	**93**	**574**	**269**	**25**	**20**	**0**	**0**	**72**	**49**	**1,200**	**701**
Scenario T2 (48 Aircraft)														
65–69	337	215	292	286	502	212	43	38	0	0	161	138	1,335	889
70–74	190	152	8	8	220	204	5	5	0	0	15	15	438	382
75–79	66	66	0	0	79	79	0	0	0	0	0	0	145	146
80–84	21	21	0	0	3	5	0	0	0	0	0	0	25	25
≥ 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ≥ 65	**614**	**454**	**300**	**294**	**804**	**500**	**48**	**43**	**0**	**0**	**176**	**153**	**1,943**	**1,442**
Scenario T3 (72 Aircraft)														
65–69	317	195	426	421	693	403	266	261	0	0	294	271	1,996	1,551
70–74	254	216	24	24	334	318	11	11	0	0	37	37	660	606
75–79	95	95	0	0	133	133	1	1	0	0	0	0	230	230
80–84	35	35	0	0	16	16	0	0	0	0	0	0	51	51
≥ 85	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Total ≥ 65	**702**	**542**	**450**	**445**	**1,176**	**870**	**278**	**273**	**0**	**0**	**331**	**308**	**2,938**	**2,439**

Note: (Number) denotes a negative number.
Source: Pima County Department of Transportation 2009.

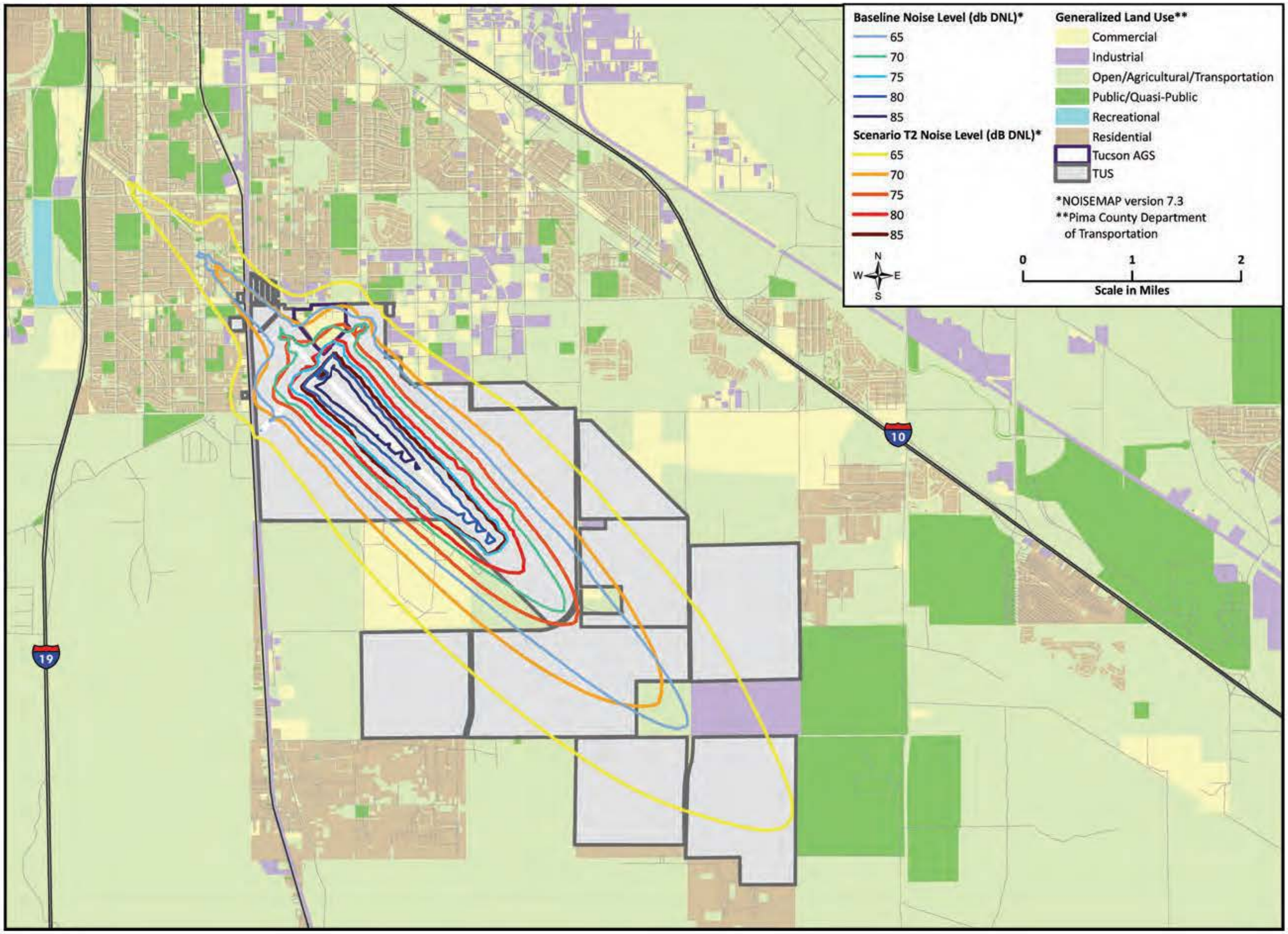


Figure TU 3.10–2. Scenario T2 and Baseline Land Use and Noise Contours in Areas Surrounding Tucson AGS

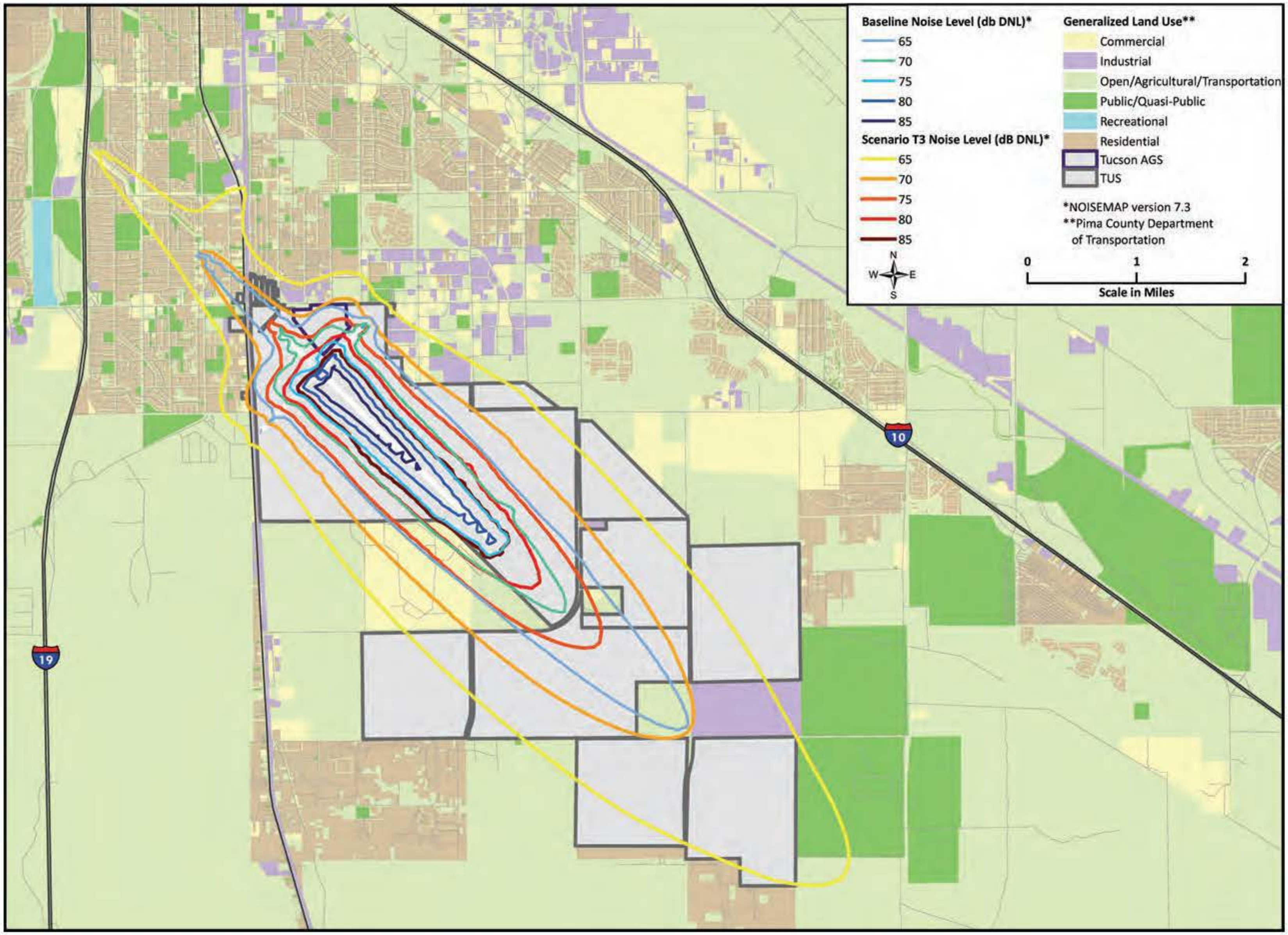


Figure TU 3.10–3. Scenario T3 and Baseline Land Use and Noise Contours in Areas Surrounding Tucson AGS

Under Scenario T1, there would be a net loss of 493 personnel and family members as a result of the drawdown of the F-16 mission as the F-35A aircraft arrive. This change in the number of people would have no impact on recreational resources.

Average noise levels would increase at all recreational locations in the areas immediately surrounding the airfield to some degree. Table TU 3.10–4 indicates which sites would experience noise levels above 65 dB DNL. Under Scenario T1, noise levels at one location, Fiesta Park, would increase to above 65 dB DNL. This popular park has an outdoor pool and picnic areas. Noise levels may interfere with persons carrying on conversations in an outdoor setting, but would remain low and well below levels of concern for compatibility.

Table TU 3.10–4. Noise Effects on Recreational Amenities Around Tucson International Airport

Recreational Amenity	*Average Noise Level (dB DNL)* Baseline Conditions	Scenario T1 (24 Aircraft)	Scenario T2 (48 Aircraft)	Scenario T3 (72 Aircraft)
Challenger Middle School	< 65	<65	<65	65–70
Fiesta Park	< 65	65–70	65–70	65–70
Mission Manor Park	< 65	< 65	<65	65–70[1]

[1] The 65 dB DNL noise contour crosses the northeast corner of the park; more than 90 percent of the park remains under < 65 dB DNL conditions.
Source: Tucson 2010.

Under all scenarios, Tucson Mountain Park, well to the west of the airfield, is not affected by noise levels of 65 dB DNL or above. Similarly, Saguaro National Park, located in two parcels on the west and east side of the city of Tucson, is not affected by average noise levels of 65 dB or above. These areas could be overflown by F-35A aircraft transiting to and from Tucson AGS, but overflights would be infrequent. F-35A aircraft at Tucson AGS would use established flight tracks, so areas that have not been directly overflown in the past are not expected to be overflown frequently under the beddown scenarios.

Scenario T2. Effects on recreation as a result of construction would be similar to those described under Scenario T1. An additional 509 personnel and family members would live in the Tucson area and use city-wide recreational facilities. This number of people would have no impact on recreational resources in a major metropolitan area like the city of Tucson.

Changes in average noise levels would have similar effects as described under Scenario T1.

Scenario T3. Effects on recreation as a result of construction would be similar to those described under Scenario T1. An additional 926 personnel and family members would live in the Tucson area and use city-wide recreational facilities. This number of people would have no impact on recreational resources in a major metropolitan area like the city of Tucson.

Changes in average noise levels would have similar effects as described under Scenario T2, with the addition of two recreational sites affected by noise levels above 65 dB DNL. Challenger Middle School would experience levels between 65 and 70 dB DNL in outdoor areas. These levels are not optimal for regular outdoor activities for children and learning activities. Therefore, the use of outdoor recreational facilities at the school is marginally compatible with this level of noise exposure. Similarly, Mission Manor Park would be newly exposed to noise

levels of between 65 and 70 dB DNL (see Table TU 3.10–4). The use of outdoor sports fields and ball courts is marginally compatible with this level of noise exposure, and the quality and enjoyment of outdoor activities could be reduced for some persons.

TU 3.10.2 Airspace

TU 3.10.2.1 Airspace Affected Environment

Land Use

This section summarizes land ownership and Special Use Land Management Areas (SULMAs) underlying the airspace units associated with Tucson AGS. A description of the primary use airspace units identified for the F-35A training mission can be found in Section TU 2.2.1. SULMAs include selected areas managed by Federal and state agencies that provide recreational and scenic opportunities (e.g., parks, monuments, and scenic river corridors), solitude or a wilderness experience (e.g., forests and wilderness areas), conservation of natural or cultural resources (e.g., wildlife refuge areas and national monuments), and other special management functions (e.g., Native American reservation lands). SULMAs often provide a combination of the attributes listed above. Some SULMAs may include recreation-oriented sites such as campgrounds, trails, and visitor centers; recreation is addressed separately below.

The F-35A training mission would use airspace located within Arizona and New Mexico, with most areas being within Arizona (see Figure TU 3.10–4). The majority of Federal land under this airspace is administered by the U.S. Bureau of Indian Affairs, followed by the U.S. Forest Service, BLM, DoD, USFWS, and the National Park Service.

Forty-nine SULMAs are located underneath one or more primary use airspace units (see Figure TU 3.10–4). The SULMAs include wilderness and wilderness study areas (WSAs), primitive areas, national forests, NWRs, national conservation areas, national monuments, Native American reservation lands, and state parks. Baseline subsonic noise levels associated with the different airspace units and numbered SULMAs shown in Figure TU 3.10–4 are identified in Table TU 3.10–5. The table also presents total acres contained in each SULMA and the percentage of each SULMA within the airspace unit(s). Supersonic operations are authorized in the Sells MOA/ATCAA at or above 10,000 feet MSL, in R-2301E at 5,000 feet AGL or above, and in R-3201E BMGR-East North TAC/South TAC Range airspace. Baseline supersonic noise levels and the number of sonic booms per day for each of these airspaces are shown in Tables TU 3.10–6 and TU 3.10–7, respectively.

Auxiliary Airfield

Libby AAF

Arizona Revised Statutes. Under Section 29-8461 of the ARS, Libby AAF is defined as a “Military Airport” and therefore is subject to the provisions of the statutes concerning such facilities. Under the ARS, a “Territory in the Vicinity of a Military Airport” is defined for Libby AAF, within which notification to purchasers of property that is within the territory is required. Section 28-8461 also defines a “high noise or accident potential zone, for Libby AAF, within which certain land uses are restricted.”

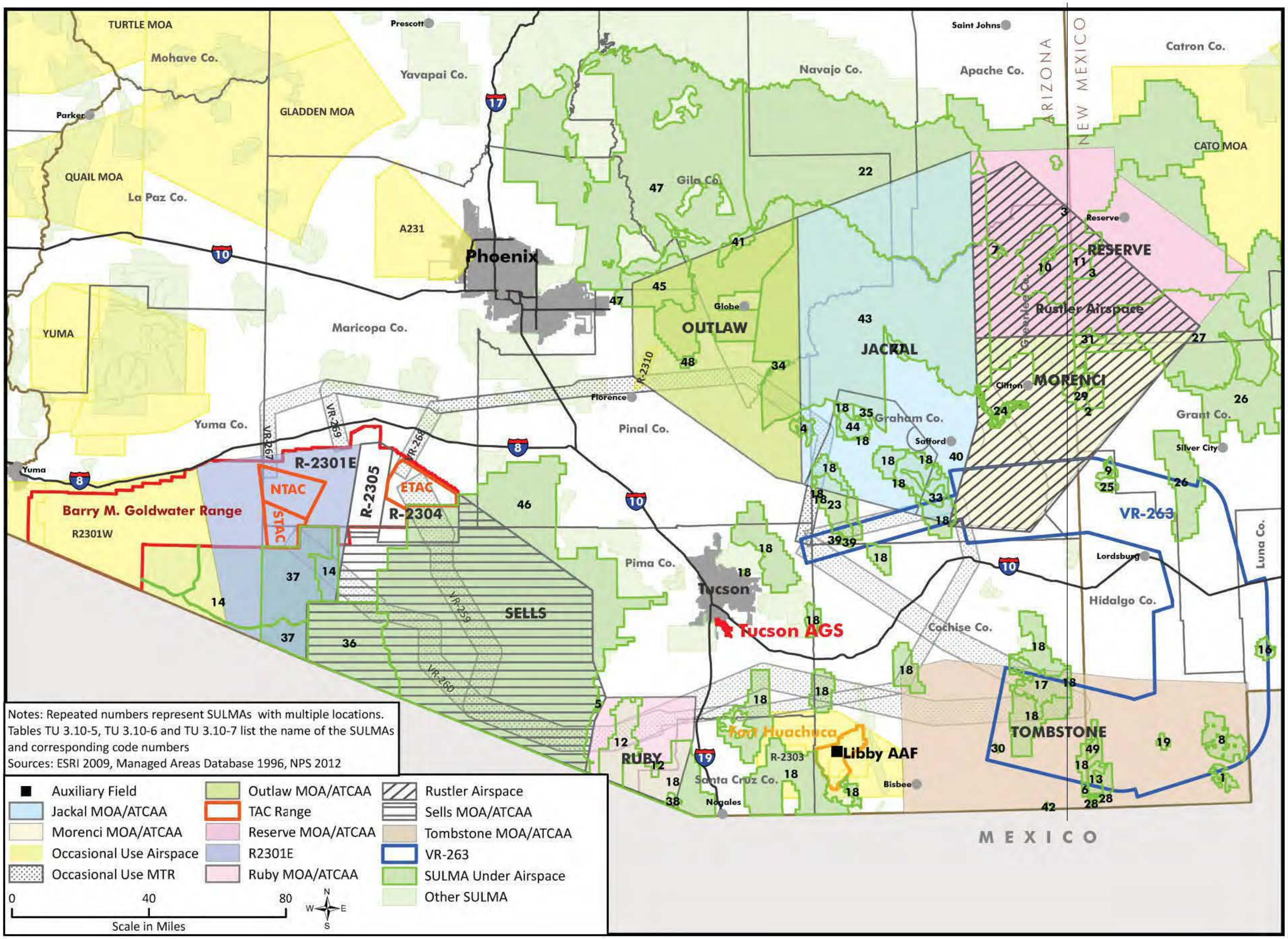


Figure TU 3.10−4. SULMAs and Airspace for Tucson AGS, Arizona

Table TU 3.10–5. Subsonic Noise Levels (DNL_{mr}) by Airspace and Associated SULMAs for Tucson AGS Primary Airspace, Baseline Conditions and F-35A Beddown Scenarios

SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	*Baseline Conditions*	*Scenario (No. of Aircraft)*					
					T1 (24)		*T2 (48)*		*T3 (72)*	
				DNL_{mr}	DNL_{mr}	Change	DNL_{mr}	Change	DNL_{mr}	Change
Jackal MOA/ATCAA										
4	Aravaipa Canyon Wilderness	19,807	64	< 45	< 45	0	< 45	0	< 45	0
18	Coronado National Forest	1,380,533	12	< 45	< 45	0	< 45	0	< 45	0
21	Fishhooks Wilderness	11,412	100	< 45	< 45	0	< 45	0	< 45	0
22	Fort Apache Indian Reservation	1,675,379	33	< 45	< 45	0	< 45	0	< 45	0
23	Galiuro Wilderness	75,630	29	< 45	< 45	0	< 45	0	< 45	0
33	Mount Graham WSA	71,934	100	< 45	< 45	0	< 45	0	< 45	0
35	North Santa Teresa Wilderness	5,738	100	< 45	< 45	0	< 45	0	< 45	0
40	Roper Lake State Park	695	100	< 45	< 45	0	< 45	0	< 45	0
43	San Carlos Indian Reservation	1,867,084	75	< 45	< 45	0	< 45	0	< 45	0
44	Santa Teresa Wilderness	28,794	100	< 45	< 45	0	< 45	0	< 45	0
Outlaw MOA/ATCAA										
4	Aravaipa Canyon Wilderness	19,807	36	< 45	< 45	0	< 45	0	< 45	0
34	Needle's Eye Wilderness	6,283	100	< 45	< 45	0	< 45	0	< 45	0
41	Salt River Canyon Wilderness	32,072	54	< 45	< 45	0	< 45	0	< 45	0
43	San Carlos Indian Reservation	1,867,084	18	< 45	< 45	0	< 45	0	< 45	0
45	Superstition Wilderness	159,100	72	< 45	< 45	0	< 45	0	< 45	0
47	Tonto National Forest	2,346,914	19	< 45	< 45	0	< 45	0	< 45	0
48	White Canyon Wilderness	6,987	100	< 45	< 45	0	< 45	0	< 45	0
Ruby MOA/ATCAA										
5	Baboquivari Peak Wilderness	2,775	< 1	53	54	1	57	4	58	5
12	Buenos Aires NWR	115,736	99	53	54	1	57	4	58	5
18	Coronado National Forest	1,380,533	9	53	54	1	57	4	58	5
38	Pajarita Wilderness	7,891	69	53	54	1	57	4	58	5
46	Tohono O'odham Indian Reservation	2,788,059	< 1	53	54	1	57	4	58	5
Rustler Airspace										
2	Apache Box WSA	1,422	100	< 45	< 45	0	< 45	0	< 45	0
3	Apache National Forest	1,806,562	41	< 45	< 45	0	< 45	0	< 45	0
3	Apache National Forest	1,806,562	10	< 45	< 45	0	< 45	0	< 45	0
7	Bear Wallow Wilderness	11,126	100	< 45	< 45	0	< 45	0	< 45	0

SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	*Baseline Conditions*	*Scenario (No. of Aircraft)*					
					T1 (24)		*T2 (48)*		*T3 (72)*	
				DNL$_{mr}$	**DNL$_{mr}$**	**Change**	**DNL$_{mr}$**	**Change**	**DNL$_{mr}$**	**Change**
10	Blue Range Primitive Area	161,851	100	< 45	< 45	0	< 45	0	< 45	0
11	Blue Range Wilderness	35,854	100	< 45	< 45	0	< 45	0	< 45	0
18	Coronado National Forest	1,380,533	< 1	< 45	< 45	0	< 45	0	< 45	0
22	Fort Apache Indian Reservation	1,675,379	3	< 45	< 45	0	< 45	0	< 45	0
24	Gila Box Riparian National Conservation Area	23,484	100	< 45	< 45	0	< 45	0	< 45	0
26	Gila National Forest	1,982,018	13	< 45	< 45	0	< 45	0	< 45	0
26	Gila National Forest	1,982,018	6	< 45	< 45	0	< 45	0	< 45	0
27	Gila Wilderness	559,200	21	< 45	< 45	0	< 45	0	< 45	0
27	Gila Wilderness	559,200	11	< 45	< 45	0	< 45	0	< 45	0
29	Hell Hole WSA	24,397	100	< 45	< 45	0	< 45	0	< 45	0
31	Lower San Francisco WSA	20,316	13	< 45	< 45	0	< 45	0	< 45	0
31	Lower San Francisco WSA	20,316	87	< 45	< 45	0	< 45	0	< 45	0
43	San Carlos Indian Reservation	1,867,084	4	< 45	< 45	0	< 45	0	< 45	0
43	San Carlos Indian Reservation	1,867,084	2	< 45	< 45	0	< 45	0	< 45	0
Sells MOA/ATCAA										
5	Baboquivari Peak Wilderness	2,775	100	< 45	< 45	0	45	0	47	2
14	Cabeza Prieta NWR	74,101	2	< 45	< 45	0	45	0	47	2
36	Organ Pipe Cactus National Monument	51,777	98	< 45	< 45	0	45	0	47	2
37	Organ Pipe Cactus Wilderness	618,026	46	< 45	< 45	0	45	0	47	2
46	Tohono O'odham Indian Reservation	2,788,059	77	< 45	< 45	0	45	0	47	2
R-2301E BMGR-East North TAC/South TAC Range Airspace										
37	Organ Pipe Cactus Wilderness	336,896	< 1	61	60	(1)	62	1	64	3
Tombstone MOA/ATCAA										
1	Alamo Hueco WSA	17,903	100	< 45	48	3	51	6	53	8
6	Baker Canyon WSA	3,976	100	< 45	48	3	51	6	53	8
8	Big Hatchet Mountains WSA	66,338	100	< 45	48	3	51	6	53	8
13	Bunk Robinson WSA	19,863	100	< 45	48	3	51	6	53	8
17	Chiricahua National Monument Wilderness	88,776	83	< 45	48	3	51	6	53	8
18	Coronado National Forest	1,380,533	17	< 45	48	3	51	6	53	8

SULMA No.	SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	Scenario (No. of Aircraft)					
					T1 (24)		T2 (48)		T3 (72)	
				DNL$_{mr}$	DNL$_{mr}$	Change	DNL$_{mr}$	Change	DNL$_{mr}$	Change
19	Cowboy Spring WSA	7,229	100	< 45	48	3	51	6	53	8
28	Guadalupe Canyon WSA	4,056	100	< 45	48	3	51	6	53	8
30	Leslie Canyon NWR	1,123	100	< 45	48	3	51	6	53	8
42	San Bernardino NWR	2,325	95	< 45	48	3	51	6	53	8
49	Whitmire Canyon WSA	9,244	100	< 45	48	3	51	6	53	8
VR-263										
1	Alamo Hueco WSA	17,903	26	< 45	56	11	59	14	61	16
6	Baker Canyon WSA	3,976	6	< 45	56	11	59	14	61	16
8	Big Hatchet Mountains WSA	66,338	100	< 45	56	11	59	14	61	16
9	Blue Creek WSA	11,960	92	< 45	56	11	59	14	61	16
13	Bunk Robinson WSA	19,863	71	< 45	56	11	59	14	61	16
16	Cedar Mountains WSA	15,237	73	< 45	56	11	59	14	61	16
17	Chiricahua National Monument Wilderness	88,776	70	< 45	56	11	59	14	61	16
18	Coronado National Forest	1,380,533	18	< 45	56	11	59	14	61	16
19	Cowboy Spring WSA	7,229	100	< 45	56	11	59	14	61	16
23	Galiuro Wilderness	75,630	12	< 45	56	11	59	14	61	16
25	Gila Lower Box WSA	8,350	100	< 45	56	11	59	14	61	16
26	Gila National Forest	1,982,018	4	< 45	56	11	59	14	61	16
30	Leslie Canyon NWR	1,123	100	< 45	56	11	59	14	61	16
33	Mount Graham WSA	71,934	5	< 45	56	11	59	14	61	16
39	Redfield Canyon Wilderness	6,209	100	< 45	56	11	59	14	61	16
49	Whitmire Canyon WSA	9,244	100	< 45	56	11	59	14	61	16

Note: (Number) denotes a negative number.
Source: ESRI 2009; Managed Areas Database 1996; NPS 2012.

Table TU 3.10–6. Supersonic Noise Levels (CDNL) by Airspace and Associated SULMAs for Tucson AGS Primary Airspace, Baseline Conditions and F-35A Beddown Scenarios

SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	*Baseline Conditions*	**Scenario (No. of Aircraft)**					
					T1 (24)		*T2 (48)*		*T3 (72)*	
				CDNL	**CDNL**	**Change**	**CDNL**	**Change**	**CDNL**	**Change**
Sells MOA/ATCAA										
5	Baboquivari Peak Wilderness	2,775	100	54	49	(5)	49	(5)	49	(5)
14	Cabeza Prieta NWR	74,101	2	54	49	(5)	49	(5)	49	(5)
36	Organ Pipe Cactus National Monument	51,777	98	54	49	(5)	49	(5)	49	(5)
37	Organ Pipe Cactus Wilderness	618,026	46	54	49	(5)	49	(5)	49	(5)
46	Tohono O'odham Indian Reservation	2,788,059	81	54	49	(5)	49	(5)	49	(5)
R-2301E BMGR-East North TAC/South TAC Range Airspace										
37	Organ Pipe Cactus Wilderness	336,896	< 1	54	49	(5)	48	(6)	48	(6)

Note: (Number) denotes a negative number.
Source: ESRI 2009; Managed Areas Database 1996; NPS 2012.

Table TU 3.10–7. Sonic Booms per Day by Airspace and Associated SULMAs for Tucson AGS Primary Airspace, Baseline Conditions and F-35A Beddown Scenarios

SULMA No.	*SULMA Name*	*SULMA Acreage*	*Percentage of SULMA Under Airspace*	*Baseline Conditions*	***Scenario (No. of Aircraft)***					
					T1 (24)		*T2 (48)*		*T3 (72)*	
				Booms/ day	**Booms/ day**	**Change**	**Booms/ day**	**Change**	**Booms/ day**	**Change**
Sells MOA/ATCAA										
5	Baboquivari Peak Wilderness	2,775	100	2.3	0.8	(1.5)	0.7	(1.6)	0.8	(1.5)
14	Cabeza Prieta NWR	74,101	2	2.3	0.8	(1.5)	0.7	(1.6)	0.8	(1.5)
36	Organ Pipe Cactus National Monument	51,777	98	2.3	0.8	(1.5)	0.7	(1.6)	0.8	(1.5)
37	Organ Pipe Cactus Wilderness	618,026	46	2.3	0.8	(1.5)	0.7	(1.6)	0.8	(1.5)
46	Tohono O'odham Indian Reservation	2,788,059	81	2.3	0.8	(1.5)	0.7	(1.6)	0.8	(1.5)
R-2301E BMGR-East North TAC/South TAC Range Airspace										
37	Organ Pipe Cactus Wilderness	336,896	< 1	2.3	0.7	(1.6)	0.5	(1.8)	0.5	(1.8)

Source: ESRI 2009; Managed Areas Database 1996; NPS 2012.

Fort Huachuca Joint Land Use Study (JLUS) (AZDOC 2007). This Joint Land Use Study (JLUS) is a guide and tool to be applied by local political jurisdictions with properties within the high hazard and noise zones associated with Fort Huachuca to protect and promote the health, welfare, and safety of the public. The JLUS identifies seven "Focus Areas" to encompass operations at the fort that extend beyond the boundaries of the fort and have the potential to affect land use compatibility. The Focus Area for Libby AAF consists of the portions of the "Territory in the Vicinity of a Military Airport" and the "high noise or accident potential zone" that are outside of the boundaries of Fort Huachuca.

City of Sierra Vista General Plan (Sierra Vista 2003). This plan designates a high noise zone associated with Libby AAF. The high noise zone extends east of the airfield beyond the boundaries of Fort Huachuca into adjacent portions of the city and Cochise County. Interior noise level reductions within the "Territory in the Vicinity of a Military Airport," as defined for Libby AAF, are addressed in the International Building Code adopted by the City of Sierra Vista, Huachuca City, and Cochise County.

On-Base Land Use. Civilian operations at Sierra Vista Municipal Airport are concentrated on the northern side of Libby AAF, and military operations are concentrated on the southern side of the airfield. Military and civilian aircraft share the runways, taxiways, navigation aids, and air traffic control. The joint use area is zoned as airfield operations, general aviation, commercial service, revenue support, and government/Federal agency use (Arizona ANG 2008). The majority of the airfield, including the runways, is classified as airfield operations. The remaining land uses occur northeast of the runways, where the municipal airport facilities are.

The baseline noise contours for Libby AAF are shown in Figure TU 3.2–4. The population and acres of land off the installation but within Sierra Vista Municipal Airport under the baseline noise contours for Libby AAF are provided in Table TU 3.2–7. Under baseline conditions, approximately 41 off-installation acres are affected by noise levels greater than 65 dB DNL. However, this area is wholly within the Sierra Vista Municipal Airport on Fort Huachuca. No populations or acres outside the boundary of Fort Huachuca are exposed to noise levels greater than 65 dB DNL. The existing noise environment at Libby AAF is discussed further in Section TU 3.2, Noise.

Surrounding Land Use. Baseline noise levels of 65 dB DNL or greater do not extend into the portions of the high noise zone located outside the boundaries of Fort Huachuca regulated by Arizona statutes and the City of Sierra Vista. Libby AAF would support the F-35A mission at Tucson AGS as an auxiliary airfield. It is a joint use civilian and military airfield located within Fort Huachuca, Arizona. Fort Huachuca is bordered to the north by Huachuca City, to the east by the city of Sierra Vista, to the west by Coronado National Forest, and to the south by unincorporated portions of Cochise County.

Recreation

Recreational opportunities underlying Tucson AGS airspace are similar to those described in Section TU 3.10.1.1. The underlying land reflects the same mosaic of Federal, state, and private ownership, with a similar range of outdoor recreational activities. The public lands support a spectrum of recreational opportunities and activities, with some areas having particular qualities or recreational purposes.

The affected region overlaps with four national forests (Tonto, Coronado, Apache, and Gila), 17 wilderness areas, 14 WSAs, the Blue Range Primitive Area, the Gila Box National Conservation Area, and four NWRs (Cabeza Prieta, Buenos Aires, San Bernardino, and Leslie Canyon). The area also includes the Organ Pipe Cactus National Monument and Roper State Park. Table TU 3.10–5 lists SULMAs underlying the Tucson AGS primary use airspace identified for F-35A training. Southeastern Arizona and southwestern New Mexico have habitats that support a wide variety of birds, particularly along waterways and in mountainous areas. These areas are popular for recreational bird watching.

Public access is permitted to limited portions of BMGR for recreation. The Sikes Act stipulates that access for wildlife-oriented recreation shall be provided to the extent possible with military use, while maintaining the priority of the military purpose and safety of public users. Recreational activities within BMGR include camping, driving, hunting, off-highway vehicle uses, and viewing of cultural and natural resources of interest. AZGFD is responsible for conserving recreational opportunities on BMGR over the long term and for providing ongoing opportunities to the extent compatible with the military mission. This includes active sports, such as hunting and off-road uses.

Auxiliary Airfield

Libby AAF. Fort Huachuca, which surrounds Libby Army Airfield, has an 18-hole golf course, bowling alley, horseback riding stables, baseball/softball fields, outdoor track, paintball area, skeet-shooting range, and other outdoor recreational facilities for use by installation personnel and family members (Fort Huachuca 2010).

The nearest off-installation recreational opportunities can be found in the city of Sierra Vista, which has numerous parks, including the Civic Center Complex, Veterans Memorial Park, Bella Vista Park, Tompkins Park, and Soldier Creek Park. The Ramsey Canyon Preserve, 6 miles south of Sierra Vista, offers wildlife viewing (with hundreds of bird species present, including 14 species of hummingbirds) and hiking.

TU 3.10.2.2 Airspace Environmental Consequences

Land Use

Scenario T1. Table TU 3.10–5 presents the SULMAs that underlie the primary use airspace units for Tucson AGS and shows the subsonic aircraft noise levels anticipated under Scenario T1. Under Scenario T1, the F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from a decrease of 1 dB DNL_{mr} to an increase of 3 dB DNL_{mr} beneath the MOA/ATCAAs and an increase of 11 dB DNL_{mr} beneath the MTR. The noise levels would remain below 65 dB DNL_{mr} beneath each of the airspace units.

Supersonic aircraft operations would occur within Sells MOA/ATCAA and R-2301E BMGR-East South TAC/North TAC Range airspace units. Scenario T1 would result in a decrease in the supersonic noise level of 5 dB CDNL beneath all three airspace units. In addition, the average number of sonic booms experienced per day under Scenario T1 would

decrease from approximately two to less than one beneath each of the three airspace units (see Table TU 3.10–7).

Federal agencies are generally mandated to manage wilderness areas for their wilderness qualities, for example, maintaining the natural setting and allowing minimal human disturbance and development. Wilderness management goals could be negatively affected by increased noise and disturbance associated with military overflights. The quality of recreation experiences in wilderness areas, recreation areas, and other specially managed lands could also be affected, depending upon the type of recreation and remoteness of the area.

Scenario T2. Under Scenario T2, the projected F-35A training exercises would result in changes in subsonic airspace noise, compared with baseline conditions, ranging from no change to an increase of 6 dB DNL_{mr} beneath the MOA/ATCAAs and an increase of 14 dB DNL_{mr} beneath the MTR (see Table TU 3.10–5). The noise levels would remain at or below 65 dB DNL_{mr} beneath each of the airspace units. Scenario T2 would result in a decrease in the supersonic noise level of 5 dB CDNL beneath Sells MOA/ATCAA and 6 dB CDNL beneath R-2301E BMGR-East South/North TAC Range airspace units (see Table TU 3.10–6). In addition, the average number of sonic booms experienced per day under Scenario T2 would decrease from approximately two to less than one beneath each of the three airspace units (see Table TU 3.10–7).

Scenario T3. Under Scenario T3, the projected F-35A training exercises would result in changes in subsonic airspace noise levels, compared with baseline conditions, ranging from no change to an increase of 8 dB DNL_{mr} beneath the MOA/ATCAAs and an increase of 16 dB DNL_{mr} beneath the MTR (see Table TU 3.10–5). The noise levels would remain below 65 dB DNL_{mr} beneath each of the airspace units. Scenario T3 would result in a decrease in the supersonic noise level of 5 to 6 dB CDNL beneath Sells MOA/ATCAA and R-2301E BMGR-East North TAC/South TAC Range airspace units (see Table TU 3.10–6). In addition, the average number of sonic booms experienced per day under Scenario T3 would decrease from approximately two to less than one beneath each of the three airspace units (see Table TU 3.10–7).

Auxiliary Airfield

Libby AAF. Projected F-35A training at Libby AAF would not require construction or modification of facilities. Under the F-35A aircraft scenarios, noise levels exceeding 65 dB DNL would affect between 72 acres under Scenario T1 and 73 acres under Scenarios T2 and T3 off the installation and within the Sierra Vista Municipal Airport (see Table TU 3.2–7). However, these areas are located entirely within Fort Huachuca. Therefore, no acres or populations outside of Fort Huachuca would be affected by noise levels greater than 65 dB DNL. Additionally, the F-35A aircraft scenarios would not affect the high noise zone associated with Libby AAF, as defined by the ARS and local regulations of Cochise County and the City of Sierra Vista, which extend beyond the boundaries of Fort Huachuca into adjacent areas.

Recreation

A synopsis of issues and methodology for addressing potential impacts from military training on recreational resources underlying training airspace are provided in Chapter 3, Section 3.8. Chapter 3, Section 3.8.2, describes typical recreational impacts common to all scenarios. More

specific changes for recreational resources affected by the F-35A staging at Tucson AGS are described below.

Primary use training airspace that would be used for F-35A aircraft at Tucson AGS does not overlie any portion of the Sonoran Desert National Monument. No activities would affect this resource.

Scenario T1. In general, a diverse range of active and passive recreational activities occurring throughout the region already coexists within a context of some exposure to military overflight. Increased average noise levels and increased numbers of operations in some airspace would increase the probability that recreational participants would experience the noise and startle effects from these activities. This could cause some degradation in enjoyment for those affected and loss of opportunity for quiet recreational environments in the region.

Increased noise could diminish opportunities for visitors to experience natural soundscapes in national park units, and could similarly diminish the qualities of natural quiet that are intrinsic to recreational opportunities in wilderness areas, WSAs, and other remote locations. Table TU 3.10–8 lists special use areas with high recreational value or opportunity underlying military training airspace and the current and projected average noise level under each scenario. Table TU 3.10–9 indicates the current and projected number of daily training operations for each airspace.

Table TU 3.10–8. Average Noise Levels by Airspace and Associated Recreational Use Areas

Airspace	*Recreational Resource*	*Baseline Conditions Noise Level (DNL_{mr})*	*Noise Level (dB DNL_{mr})* Scenario (No. of Aircraft) T1 (24)	T2 (48)	T3 (72)
Ruby MOA/ATCAA	Buenos Aires NWR, Pajarita Wilderness	53	54	57	58
Outlaw MOA/ATCAA	Aravaipa Canyon Wilderness, Needles Eye Wilderness, Salt River Canyon Wilderness, Superstition Wilderness, White Canyon Wilderness	< 45	< 45	< 45	< 45
Jackal MOA/ATCAA	Galiuro Wilderness, Gila Box NCA, North Santa Teresa Wilderness, Roper Lake SP, Santa Teresa Wilderness	< 45	< 45	< 45	< 45
Sells MOA/ATCAA	Baboquivari Peak Wilderness, Cabeza Prieta NWR, Organ Pipe Cactus NM, Organ Pipe Cactus Wilderness	45	< 45	45	47
Rustler Airspace	Bear Wallow Wilderness, Blue Range Wilderness, Escudilla Wilderness, Gila Box NCA and Wilderness, Mount Baldy Wilderness	< 45	< 45	< 45	< 45
Tombstone MOA/ATCAA	Chiricahua NM, Leslie Canyon NWR, San Bernardino NWR	45	48	51	53
R-2301E BMGR North/South TAC Range	Organ Pipe Cactus Wilderness (No public access)	61	60	62	64
VR-263	Chiricahua NM, Galiuro Wilderness, Leslie Canyon NWR, Redfield Canyon Wilderness	< 45	56	59	61

Key: NCA=national conservation area; NM=national monument; NWR=National Wildlife Refuge; SP=state park.

Table TU 3.10–9. Daily Operations by Airspace and Associated Recreational Use Areas

Airspace	Recreational Resource	Baseline Conditions	Daily Sortie-Operations[1] Scenario (No. of Aircraft) T1 (24)	T2 (48)	T3 (72)
Ruby MOA/ATCAA	Buenos Aires NWR, Pajarita Wilderness	8	7	10	14
Outlaw MOA/ATCAA	Aravaipa Canyon Wilderness, Needles Eye Wilderness, Salt River Canyon Wilderness, Superstition Wilderness, White Canyon Wilderness	6	5	7	9
Jackal MOA/ATCAA	Galiuro Wilderness, Gila Box NCA, North Santa Teresa Wilderness, Roper Lake SP, Santa Teresa Wilderness	8	9	14	19
Sells MOA/ATCAA	Baboquivari Peak Wilderness, Cabeza Prieta NWR, Organ Pipe Cactus NM	44	23	24	28
Rustler Airspace	Bear Wallow Wilderness, Blue Range Wilderness, Escudilla Wilderness, Gila Box NCA and Wilderness, Mount Baldy Wilderness	9	6	8	11
Tombstone MOA/ ATCAA	Chiricahua NM, Leslie Canyon NWR, San Bernardino NWR	13	6	6	7
R-2301E BMGR North/South TAC Range	Organ Pipe Cactus Wilderness (No public access)	81	35	32	34
VR-263	Chiricahua NM, Galiuro Wilderness, Leslie Canyon NWR, Redfield Canyon Wilderness	1	1	1	1

[1] Average daily operations were estimated by dividing annual operations by 261 annual operational days.
Key: NCA=national conservation area; NM=national monument; NWR=National Wildlife Refuge; SP=state park.

Average noise levels underlying training airspace under Scenario T1 tend to decrease, except for areas underlying Ruby and Tombstone MOAs and VR-263, generally reflecting reductions in operations. Slight increases in Ruby and Tombstone MOAs (1 and 3 dB increases to levels of 54 and 48 DNL_{mr}, respectively) would result in minimal effects on the noise environment and recreation in underlying areas (see Table TU 3.10–8).

VR-263 would experience a substantial 11 dB increase up to 56 DNL_{mr}. Operations in the MTR would remain infrequent (at about one event per day). This increase reflects the louder engine of the F-35A aircraft. Isolated single events may disturb recreational users in Chiricahua National Monument, Galiuro Wilderness, Leslie Canyon NWR, and Redfield Canyon Wilderness, but these would be occasional and would have a limited impact on most persons' recreational experiences.

The F-35A would generate sonic booms, similar to the F-16 aircraft. The numbers of booms are projected to decrease under all F-35A beddown scenarios, resulting in a beneficial change for recreational use. The potential for isolated events to interfere with persons who are engaging in recreational activities throughout the affected area would still exist, but the frequency of these events is not expected to increase. Areas supporting recreational uses sensitive to loud, intrusive noise, such as wilderness areas and wildlife refuges, would benefit from fewer sonic booms.

Federal agencies are generally mandated to manage wilderness areas for their wilderness qualities, for example, maintaining the natural setting and allowing minimal human disturbance and development. Wilderness management goals could be negatively affected by increased noise and disturbance associated with military overflights. The quality of recreation experiences in wilderness areas, recreation areas, and other specially managed lands could also be affected, depending upon the type of recreation and remoteness of the area.

Scenario T2. Impacts under Scenario T2 would be similar to those described above under Scenario T1, with a moderate increase in average noise levels over baseline conditions in Tombstone and Ruby MOAs. However, subsonic noise levels would also increase under Scenario T2 beneath BMGR North and South TAC Range airspace by 1 dB relative to baseline conditions. Daily operations would increase slightly over baseline levels in Ruby, Outlaw, and Jackal MOAs/ATCAAs. These operations are spread over a large area and generally occur at higher altitudes than current training. The potential for an increase in overflight of any specific sensitive recreational areas would be negligible.

Sonic booms would decrease in number for all airspace elements under Scenario T2. This would lessen the potential for hazardous or annoying incidents resulting from a startling noise event. Areas supporting recreational uses sensitive to loud, intrusive noise, such as wilderness areas and wildlife refuges, would benefit from fewer sonic booms.

Implementation of Scenario T2 would result in changes in airspace noise, compared with baseline conditions, ranging from no change to an increase of 16 dB DNL_{mr} (under VR-263). Noise levels beneath primary training airspace units would vary between less than 45 dB DNL_{mr} and 62 dB DNL_{mr} (under the BMGR North and South TAC Ranges). Areas located under VR-263, including Chiricahua National Monument, Galiuro Wilderness, Leslie Canyon NWR, and Redfield Canyon Wilderness, would be exposed to some of the highest noise increases.

Scenario T3. Impacts under Scenario T3 would be similar to those described above under Scenario T1 and T2. Under Scenario T3, additional increases in daily operations would occur in Ruby, Outlaw, Jackal, and Tombstone MOAs/ATCAAs and Rustler Airspace. Jackal MOA would experience the most change because daily operations would more than double over baseline levels. These operations are spread over a large area, and the potential increase for overflight of any specific sensitive location would remain low.

Noise levels beneath Tombstone MOA and Ruby MOAs would increase by 8 and 5 dB, respectively, with levels remaining under 60 DNL_{mr}. These levels would be relatively compatible with underlying recreation (in Baboquivari Wilderness, Buenos Aires NWR, Pajarita Wilderness, Chiricahua National Monument, Leslie Canyon NWR, San Bernardino NWR) considering the history of military activity in the airspace. Sells MOA, overlying Baboquivari Peak Wilderness, Cabeza Prieta NWR, and Organ Pipe Cactus National Monument would have a 2 dB increase (up to 47 dB DNL_{mr}) in noise but fewer daily operations than under baseline conditions.

Daily operations would remain lower than baseline levels in BMGR North and South TAC airspace, although there would be a 3 dB increase, up to 64 dB DNL_{mr}. With limited public access in underlying areas, the effect on recreation would be negligible. Recreational areas under VR-263 would experience the greatest increase and most noticeable change in the locations described for Scenarios T1 and T2. Daily operations would increase by 75 percent (to 14 daily) in the Ruby MOA and more than double (up to 19 daily) in Jackal MOA. Because these are distributed over a large area, the chance of a loud overflight of any given underlying location would remain relatively low. All other airspaces would have similar or fewer daily operations with no noticeable change or improved conditions (particularly under the Sells MOA). Sonic booms would decrease in number for all airspace elements under Scenario T3. This would lessen the potential for hazardous or annoying incidents resulting from a startling noise event. Areas sensitive to loud, intrusive noise, such as wilderness areas and wildlife refuges, would benefit from fewer sonic booms.

Auxiliary Airfield

Libby AAF. Under all F-35A aircraft scenarios, noise levels above 65 dB DNL in the vicinity of Libby AAF would be contained within the boundary of Fort Huachuca. There would be no impact from F-35A training operations on public recreational amenities of Sierra Vista.

The Fort Huachuca area is highly valued for bird-watching opportunities. Flight paths over flyways in the Fort Huachuca mountains may disturb the quiet needed for identifying bird calls. Buffalo Corral Riding Stables on Fort Huachuca uses the surrounding area for cross-country rides. Loud noise from arriving and departing F-35A performing pattern work at Libby AAF could cause a nervous horse to react and throw a rider.

TU 3.11 Socioeconomics

TU 3.11.1 Base

The ROI for socioeconomics for the Tucson AGS alternative is defined as Pima County, Arizona, and the city of Tucson. Potential socioeconomic consequences from the F-35A training activities would be concentrated within the county and, more particularly, within the city. The definition of socioeconomic resources and methodology for analysis are described in Chapter 3, Section 3.9.

TU 3.11.1.1 Base Affected Environment

Population. In 2010, Pima County was ranked as the second most populated county in Arizona, with a total of 980,263 persons, and accounted for approximately 15.3 percent of the total population of Arizona (see Table TU 3.11–1) (USCB 2010a). In 2010, the city of Tucson had a population of 520,116 persons, following an average annual increase of 0.7 percent. The Arizona Air National Guard Base supports approximately 1,440 full-time and traditional Guardsmen and civilian contractors (162 FW 2009). Information is presented for Pima County, the city of Tucson, and the state of Arizona where data are available.

Table TU 3.11–1. Population Growth, 2000–2010

Location	*Census 2000*	*Census 2010*	*Average Annual Percentage Change 2000–2010*
Pima County	843,746	980,263	1.5
City of Tucson	486,699	520,116	0.7
Arizona	5,130,632	6,392,017	2.2

Source: USCB 2000a, 2000b, 2010a.

Housing. As of 2010, there were 440,909 housing units in Pima County, 88 percent of which were occupied (USCB 2010a). At the same time, there were approximately 229,762 housing units in Tucson, following an increase from 209,609 units in 2000. Approximately 205,390 housing units were occupied in Tucson, for an occupancy rate of 89 percent.

There is no on-base housing available at Tucson AGS. All personnel assigned to Tucson AGS rely on the private market for housing.

During scoping, several commenters expressed concern that the noise generated by the F-35A training at Tucson AGS could adversely affect property values, particularly in those neighborhoods immediately surrounding the airport. In the state of Arizona, property values are determined based on the full cash value (market value) of the property. The market value is then input into state-mandated formulas to calculate the assessed value and then the primary and secondary property taxes. The market value is calculated as the amount a buyer would be willing to pay for the property at a given moment in time. Two similar properties could have different market values based on factors such as proximity to schools and shopping; quality of neighboring properties; and neighborhood amenities, such as parks.

The recent recession and decline in housing values has had a severe impact on the real estate market and housing values, particularly in Tucson and Pima County. The lower sales prices described above would be reflected in the comparable sales evaluation of the market value of properties and would result in lower property values.

Schools. There are 275 public schools in 18 school districts serving Pima County (PCSS 2008). There were a total of 133,718 students enrolled in Pima County public schools during the 2007–2008 school year (ADE 2010). Of the school districts within the city of Tucson and its nearby communities, there were a total of 214 schools, with a combined enrollment of 118,061 students. The average student-to-teacher ratio of these school districts is 16.97 (see Table TU 3.11–2). The State of Arizona has not stipulated maximum allowable class sizes.

Total Employment. Total employment in Pima County in 2008 was 520,444 jobs. Between 2006 and 2008, employment grew at an average annual rate of approximately 1.8 percent. The government and government enterprises industry, particularly local and state government, has a total employment of 68,653 jobs; followed by retail trade, with 56,172 jobs; and health care and social assistance, with 61,702 jobs (BEA 2010).

Table TU 3.11–2. Schools in the ROI, FY2008–2009

District	Total Revenues (dollars)	Total Expenditures (dollars)	Fall 2008 Enrollment	Number of Schools	Students Per Staff[1]	
					Admins	Teachers
Amphitheater Unified	156,444,833	161,955,065	16,077	20	328.17	16.15
Catalina Foothills Unified	54,541,822	49,682,438	4,959	8	254.31	17.11
Flowing Wells Unified	46,144,387	16,620,159	5,730	10	293.85	17.08
Pima Accommodation	1,358,429	1,465,439	126	2	50.4	18
Sahuarita Unified	42,109,173	41,838,236	4,917	6	293.55	18.21
Sunnyside Unified	142,190,417	147,980,956	17,782	23	335.51	17.45
Tanque Verde Unified	14,167,213	13,442,756	1,469	4	226	14.92
Tucson Unified Map	510,123,134	523,961,141	57,406	125	294.99	17.13
Vail Unified	74,221,571	77,392,094	9,595	16	275.4	16.7
Total ROI	**1,041,300,979**	**1,034,338,284**	**118,061**	**214**	**261.35**	**16.97**

[1] Students per staff for the total ROI represent the average number of administrative staff and average number of teachers over all school districts in the ROI.
Source: ADE 2010.

The military industry is one of the largest industries in the state of Arizona and has an annual economic impact of $9 billion (AZDOC 2008). The 162 FW at Tucson AGS serves as an economic element in Pima County. The 162 FW currently employs approximately 1,500 residents of Tucson and has an annual total economic impact of $280 million (AZDOC 2008).

Public Services. Public services are provided by the county and city governments in Pima County and the city of Tucson, as well as other government agencies. Changes in population would affect the demand for these services, as well as the ability to fund them.

Tax revenues collected by the State of Arizona in FY2008–2009 totaled over $11.9 billion, including a combination of property taxes, sales taxes, and income taxes. In the same fiscal year, Pima County collected over $785 million in tax revenues, and the City of Tucson collected over $709 million in tax revenues.

There are 1,485 employees in the various police departments in the city of Tucson, including South Tucson and the University of Arizona (ADPS 2009). Tucson is served by 1,517 career firefighters, in addition to many volunteer firefighters (USFA 2010). The number of medical professionals within the city of Tucson is not available. However, the city of Tucson is a major metropolitan area with leading medical facilities, including the Northwest Medical Center, the Tucson Medical Center, University Medical Center, St. Mary's Medical Center, St. Joseph's Medical Center, and the Tucson Heart Hospital.

TU 3.11.1.2 Base Environmental Consequences

Employment and Population. Potential socioeconomic impacts from construction expenditures and the change in personnel due to the F-35A beddown are summarized in Table TU 3.11–3. The direct jobs listed under construction would be new construction-related jobs. The indirect and induced jobs created by the construction expenditures would be spread among a variety of

industries supporting construction, such as supplies and materials, food services, and retail services. The construction jobs under each scenario would constitute less than 1 percent of the total employment in Pima County and are not likely to generate migration into the area. Construction expenditures and the jobs created would be temporary and would result in 2–3 years of stimulation to the local construction industry.

Table TU 3.11–3. Potential Socioeconomic Impacts, Scenarios T1, T2, and T3

	Scenario T1 (24 Aircraft)	*Scenario T2 (48 Aircraft)*	*Scenario T3 (72 Aircraft)*
Construction (jobs)			
Direct	1,239	1,288	1,409
Indirect	273	284	359
Induced	303	315	321
Total	**1,815**	**1,887**	**2,089**
Population (persons)[1]			
Existing Conditions[3]	520,116	520,116	520,116
Direct	(493)	509	926
Total	**519,623**	**520,625**	**521,042**
Percentage Change	*(0.09)*	*0.10*	*0.18*
Employment (jobs)[2]			
Existing Conditions[4]	520,444	520,444	520,444
Direct	(133)	200	351
Induced	(47)	70	123
Total	**520,264**	**520,714**	**520,918**
Percentage Change	*(0.03)*	*0.05*	*0.09*
Housing (units)[1]			
Existing Conditions[3]	229,762	229,762	229,762
Direct	(133)	200	351
Total	**229,629**	**229,962**	**230,113**
Percentage Change	*(0.06)*	*0.09*	*0.15*
Student (persons)[1]			
Existing Conditions[5]	118,061	118,061	118,061
Direct	(130)	195	342
Total	**117,931**	**118,256**	**118,403**
Percentage Change	*(0.11)*	*0.17*	*0.29*
Student-Teacher Ratio	16.97	16.97	16.97
Number of Potential New Teachers	–	12	20
Tax Revenues (million dollars)[2]			
State and Local Taxes	(0.82)	1.24	2.17
Federal Taxes	(2.72)	4.10	7.19
Total	**(3.54)**	**5.34**	**9.36**

	Scenario T1 (24 Aircraft)	*Scenario T2 (48 Aircraft)*	*Scenario T3 (72 Aircraft)*
Law Enforcement (persons)[1]			
Existing Conditions[6]	2,913	2,913	2,913
Direct	–	3	5
Total	**2,913**	**2,916**	**2,918**
Percentage Change	–	*0.10*	*0.17*
Firefighters (persons)[1]			
Existing Conditions[7]	1,517	1,517	1,517
Direct	–	1	3
Total	**1,517**	**1,518**	**1,520**
Percentage Change	–	*0.07*	*0.20*

[1] City of Tucson ROI.
[2] Pima County ROI.
[3] Source: USCB 2010a.
[4] Source: BEA 2010.
[5] Source: ADE 2010.
[6] Source: ADPS 2009.
[7] Source: USFA 2010.
Note: (Number) indicates a negative number.

Under each F-35A aircraft scenario, the population change would constitute substantially less than a 1 percent change in the total population of the city of Tucson.

The unemployment rate in Pima County was 9.0 percent in 2010, with a total of 44,400 unemployed persons (BLS 2011). The degree of induced employment growth is such that the positions could be filled by unemployed persons currently in the county or by spouses of the incoming personnel without generating migration into the ROI. Under Scenario T3, the indirect and induced employment from the construction expenditures and the personnel change have the potential to reduce the unemployment rate to as low as 8.9 percent, all other variables being equal.

Housing. Assuming one household for each new member of Tucson AGS personnel, the demand for housing would increase, as shown in Table TU 3.11–3. The housing market is not anticipated to be adversely affected by the increase in housing demand under any of the F-35A aircraft scenarios. Tucson AGS does not have any on-base housing. New F-35A personnel, including F-35A students, would be dependent on the community for housing. There were approximately 24,372 vacant housing units in the city of Tucson in 2010. The demand for up to 351 housing units within the city would not present an adverse impact on the housing market.

Schools. The number of school-aged dependents between the ages of 4 and 18 was estimated and listed as students in Table TU 3.11–3. The average student-to-teacher ratio for the schools in Tucson is 16.97 to 1 (see Table TU 3.11–2). With the small number of students being added compared with the total enrollment of schools in the city of Tucson, it is anticipated that the schools would have the capacity to accept the incoming students without impacting school resources.

Public Services. Provision of public services is dependent on the population needing the services and the ability of the state and local communities to provide these services, as supported by tax revenues. Using the Impact Analysis for Planning (IMPLAN) economic forecasting model, the amount of Federal, state, and local tax revenues generated by the increase in population and employment was estimated and is presented in Table TU 3.11–3.

The number of additional law enforcement officers and firefighters has been estimated by determining the existing proportion of these services to the current population. The estimated population increase under each F-35A aircraft scenario would potentially support the addition of up to five law enforcement officers and up to three firefighters. The number of medical professionals in the area is not available. However, the surrounding metropolitan area is large enough to support the medical needs of an estimated population increase of less than 1 percent, as projected under Scenarios T1 through T3. It is not anticipated that the population change would impact the provision of public services.

Noise. Airfield flight operations of the F-35A at Tucson AGS are expected to increase the number of residents affected by noise levels greater than 65 dB DNL, compared with the baseline flight operations of Tucson AGS and TUS (see Table TU 3.11–4). Residents within the 65 dB DNL noise contour could be significantly affected by the increased noise. The impact of these noise levels as it relates to potential hearing loss is discussed in detail in Section TU 3.2.

Table TU 3.11–4. Estimated Residents Affected by Noise Levels Greater Than 65 dB DNL, Baseline Conditions and F-35A Beddown Scenarios

Noise Levels (dB DNL)	*Baseline Conditions*	*Scenario T1 (24 Aircraft)*	*Scenario T2 (48 Aircraft)*	*Scenario T3 (72 Aircraft)*
Total ≥ 65	**407**	**1,918**	**4,378**	**8,534**
65–69	407	1,902	4,068	7,817
70–74	-	16	310	717
75–79	-	-	-	-
80–84	-	-	-	-
≥ 85	-	-	-	-

Source: USCB 2010a, as analyzed using GIS.

Property Values. Specific property values under noise contours would depend upon a variety of supply and demand variables. As described in Chapter 3, Section 3.9.2, a review of 33 studies of residential properties near airports resulted in the estimate that a specific residential property could be discounted between 0.5 and 0.6 percent per decibel when exposed to noise levels between 65 dB DNL and 75 dB DNL. Any discount in property values would be expected to be reflected in subsequent property tax assessments and associated property tax collections.

The noise generated by the F-35A could have an adverse impact on property values for those properties that would be newly exposed to noise levels above 65 dB DNL and especially for properties newly exposed to noise levels above 75 dB DNL, which the EPA considers incompatible with residential use. No residents in the city of Tucson are expected to be exposed to noise levels above 75 dB DNL (see Table TU 3.11–4).

TU 3.11.2 Airspace

The ROI for socioeconomic resources under the airspace to be used by the F-35A includes the counties or the portions of the counties under the primary use airspace. Primary use airspace has been defined as airspace that would be used by the F-35A on a daily basis. Occasional use airspace would be used by the F-35A when the primary use airspace is unavailable. The occasional use airspace would be used infrequently; therefore, potential impacts on the areas underlying the occasional use airspace would be negligible. The definition of resources and methodology for analysis are described in Chapter 3, Section 3.9.

TU 3.11.2.1 Airspace Affected Environment

The F-35A would utilize the same airspace currently used by the F-16 mission at Tucson AGS. The primary use airspace for the F-35A includes the existing Jackal, Outlaw, Ruby, and Tombstone MOAs/ATCAAs and the Rustler Airspace, which is a combination of the Morenci MOA and a portion of the Reserve MOA. The dimensions and use of this airspace are described in more detail in Section TU 3.1. There are several other airspace units in proximity to Tucson AGS in which the F-35A could potentially train on an occasional-use basis when the primary airspace is unavailable.

One MTR would be used by the F-35A as primary use airspace, as shown in Table TU 2.2–2; however, this airspace unit represents only a narrow corridor of airspace, which overlies only small portions of remote counties. No socioeconomic impacts are expected from the F-35A using this MTR.

Because no new airspace or airspace modifications are proposed for the F-35A beddown, no additional population would be affected by training overflights. The area under the airspace is not densely populated. GIS and 2010 census data were used to estimate the population under the training airspace (see Table TU 3.11–5). No population centers are located beneath R-2301E; therefore, this airspace unit is not listed in the table below.

In addition to use of airspace and BMGR, F-35A aircraft at Tucson AGS would use Libby AAF, located at Fort Huachuca in Sierra Vista, Arizona, as an auxiliary airfield for certain training events. Noise analysis conducted for Libby AAF of baseline flight operations and projected F-35A flight operations described in Section TU 3.2 show that the baseline and projected noise contours do not extend outside of the post boundaries of Fort Huachuca and do not affect off-post residents. Therefore, no additional socioeconomic analysis was conducted.

Table TU 3.11–5. Population Under the F-35A Primary Use Airspace at Tucson AGS

Airspace Units	*Counties Overflown*	*Affected Population (2010)*	*Total Population of Counties Overflown (2010)*	*Percentage of Total County Population*
Jackal MOA/ATCAA	Apache, Arizona	40,382	71,518	6.26
	Gila, Arizona		53,597	
	Graham, Arizona		37,220	
	Navajo, Arizona		107,449	
	Pinal, Arizona		375,770	
Outlaw MOA/ATCAA	Gila, Arizona	42,045	53,597	0.99
	Maricopa, Arizona		3,817,117	
	Pinal, Arizona		375,770	
Ruby MOA/ATCAA	Pima, Arizona	7,691	980,263	0.75
	Santa Cruz, Arizona		47,420	
Rustler Airspace	Apache, Arizona	16,972	71,518	10.93
	Catron, New Mexico		3,725	
	Graham, Arizona		37,220	
	Grant, New Mexico		29,514	
	Greenlee, Arizona		8,437	
	Hidalgo, New Mexico		4,894	
Sells MOA/ATCAA	Maricopa County, Arizona	8,623	3,817,117	0.17
	Pima County, Arizona		980,263	
	Pinal County, Arizona		375,770	
Tombstone MOA/ATCAA	Cochise, Arizona	33,227	131,346	20.59
	Hidalgo, New Mexico		4,894	
	Luna, New Mexico		25,095	
BMGR (R-2301E)	Maricopa County, Arizona	0	3,817,117	0.00
	Pima County, Arizona		980,263	
	Yuma County, Arizona		185,751	
BMGR (R-2304)	Maricopa County, Arizona	0	3,817,117	0.00
BMGR (R-2305)	Maricopa County, Arizona	0	3,817,117	0.00

Source: USCB 2010a, as analyzed using GIS.

TU 3.11.2.2 Airspace Environmental Consequences

F-35A aircraft using the airspace units listed in Table TU 3.11–5 would be governed by the same regulations and guidelines as the aircraft currently using the airspace. Supersonic operations would only take place above the minimum altitudes designated for each airspace unit. Flight safety guidelines are discussed in Section TU 3.4. The population under the primary use airspace units is currently exposed to military aircraft overflights and supersonic operations. The population density under each airspace unit is relatively low, at less than 15 persons per square mile for each airspace unit, compared with the average population density of 45.2 persons per square mile for the state of Arizona.

Noise levels in the airspace are discussed in more detail in Section TU 3.2. Table TU 3.2–4 presents the primary use airspace units under each aircraft scenario and the resulting change in noise levels from projected F-35A flight operations. Noise levels in the Jackal, Outlaw, and Tombstone MOAs/ATCAAs and the Rustler Airspace would remain below 55 dB DNL under all aircraft scenarios. Residents under the Ruby MOA/ATCAA are currently exposed to noise levels of 53 dB DNL. Under each of the aircraft scenarios, noise levels under this airspace would increase; under Scenario T3, the noise level would reach 58 dB DNL.

The BMGR restricted airspace currently experiences noise levels greater than 55 dB DNL. However, with an active bombing range and public lands beneath the restricted airspace, private residences would not be located under the airspace and, therefore, would not be impacted by these noise levels.

Therefore, while residents may notice the change in noise levels under the primary use airspace and be annoyed, the change in noise levels is not expected to adversely impact economic decisions, property values, or other socioeconomic resources.

TU 3.12 Environmental Justice and Protection of Children

TU 3.12.1 Base

The ROI for environmental justice and protection of children is defined as the region in which there is the potential for adverse impacts from construction or flight operations. This region includes the area potentially impacted by high noise levels. In accordance with the *Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process* (Air Force 1997b), the ROI is compared with the community of comparison, which is defined as Pima County. The definition of environmental justice and methodology for analysis are described in Chapter 3, Section 3.10.

TU 3.12.1.1 Base Affected Environment

The analysis of environmental justice for the base and vicinity considers changes in airfield noise levels caused by the F-35A beddown scenarios. The existing area affected by noise levels from Tucson AGS is depicted in Figure TU 3.2–1. Using 2010 census data, the number of persons affected by off-base noise from Tucson AGS and TUS was estimated. Under baseline conditions, 407 persons are affected by noise levels greater than 65 dB DNL (see Table TU 3.12–2). Of these persons affected, approximately 37.3 percent are minorities and 36.6 percent are low-income (see Section TU 3.12.1.2, Table TU 3.12–2). Baseline noise levels over 70 dB DNL do not extend beyond the airport property.

Table TU 3.12–1 identifies total population and percentage populations of concern in Pima County, which serves as the community of comparison required for environmental justice analysis, as well as in the state of Arizona and the United States. The total population in 2010 for Pima County was 980,263 persons, representing 15.3 percent of Arizona's population (6,392,017 persons).

Table TU 3.12–1. Total Population and Populations of Concern, 2010

Location	*Total Population*	*Percentage Minority*	*Percentage Low-Income*	*Percentage Youth*
Pima County	980,263	44.7	15.7	23.0
Arizona	6,392,017	42.2	14.7	25.5
United States	308,745,538	36.3	13.5	24.0

Source: USCB 2010a, 2010b.

Minority persons represent 44.7 percent of the total population in Pima County and 42.2 percent of the state population. The minority population at the national level is 36.3 percent. Persons categorized as Hispanic or Latino were the predominant minority group, with 34.6 percent of the total population in Pima County and 29.6 percent at the state level.

The percentage of persons and families in Pima County with incomes below the poverty level was higher than state levels, averaging 15.7 percent in the county, compared with 14.7 percent in Arizona.

The youth population, comprising children under the age of 18 years, constitutes 23.0 percent of the Pima County population, compared with 25.5 percent for Arizona overall, and 24.0 percent for the Nation. No schools or child care centers are currently affected by noise levels greater than 65 dB DNL from Tucson AGS (see Section TU 3.12.1.2, Table TU 3.12–3).

TU 3.12.1.2 Base Environmental Consequences

No disproportionately high and adverse human health or environmental effects on minority or low-income populations have been identified as a result of construction activities on Tucson AGS. Construction would occur within the Tucson AGS cantonment area and would not affect off-base populations.

Residents within the 65 dB DNL noise contour could be significantly affected by the increased noise. Table TU 3.12–2 lists the estimated population affected by noise levels greater than 65 dB DNL under each aircraft scenario, as well as the estimated share of minority and low-income populations affected. The estimated number of individual schools and child care centers affected by noise levels greater than 65 dB DNL are listed in Table TU 3.12–3.

Table TU 3.12–2. Estimated Populations of Concern Affected by Noise Levels Greater Than 65 dB DNL

	Total Affected Population	*Number (Percentage) Minority*		*Number (Percentage) Low-Income*	
Baseline Conditions	407	378	(92.9)	149	(36.6)
Scenario T1 (24 Aircraft)	1,919	1,799	(93.7)	697	(36.3)
Scenario T2 (48 Aircraft)	4,378	4,107	(93.8)	1,458	(33.3)
Scenario T3 (72 Aircraft)	8,534	7,530	(88.2)	2,863	(33.5)

Source: USCB 2010a, 2010b, as analyzed using GIS.

Table TU 3.12–3. Number of Schools and Child Care Centers Affected by Noise Levels Greater Than 65 dB DNL

Noise Levels (dB DNL)	*Baseline Conditions*		*Scenario T1 (24 Aircraft)*		*Scenario T2 (48 Aircraft)*		*Scenario T3 (72 Aircraft)*	
	Schools	Child Care Centers	Schools	Child Care Centers	Schools	Child Care Centers	Schools	Child Care Centers
Total ≥ 65	**–**	**–**	**1**	**–**	**2**	**1**	**2**	**1**
65–69	–	–	1	–	2	1	1	1
70–74	–	–	–	–	–	–	1	–
75–79	–	–	–	–	–	–	–	–
80–84	–	–	–	–	–	–	–	–
≥ 85	–	–	–	–	–	–	–	–

As described in Section TU 3.12.1.1, in Pima County, which is defined as the community of comparison, the minority population constitutes 44.7 percent of the total population, and the low-income population constitutes 15.7 percent. The share of minority populations affected by noise levels greater than 65 dB DNL under all scenarios, as well as baseline conditions, is substantially higher than the share of the minority populations in Pima County. The share of low-income persons affected by the F-35A noise levels is greater than the share of low-income populations in Pima County. Therefore, the F-35A aircraft scenarios would present a disproportionately high and adverse environmental impact on low-income populations.

Schools and child care centers are considered compatible with noise levels up to 75 dB DNL with additional noise attenuation. For noise levels above 75 dB DNL, educational services are not compatible regardless of noise attenuation. Additionally, these noise levels are not compatible with outdoor use and could contribute to hearing loss in children regularly exposed to aircraft noise. Table TU 3.12–3 presents the estimated number of schools and child care centers affected by F-35A noise levels greater than 65 dB DNL.

The noise levels generated under the F-35A aircraft scenarios in regard to schools and child care centers would have potential adverse impacts on children at these locations. Because noise levels at these locations would be below 75 dB DNL, these facilities could be made compatible with additional noise attenuation to address the potential adverse impacts. Additional detail concerning noise and the potential for interference with learning in terms of ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI 2009) is provided in Section TU 3.2, Noise.

TU 3.12.2 Airspace

The ROI for environmental justice and protection of children under the airspace to be used by the F-35A includes the counties or the portions of the counties under the primary use airspace. Primary use airspace has been defined as airspace that would be used by the F-35A on a daily basis. Occasional use airspace would be used by the F-35A when the primary use airspace is unavailable. The occasional use airspace would be used infrequently; therefore, potential impacts on the areas underlying the occasional use airspace would be negligible. The definition of environmental justice and methodology for analysis are described in Chapter 3, Section 3.10.

TU 3.12.2.1 Airspace Affected Environment

The number of minority and low-income individuals, and persons under the age of 18 under the primary use airspace was estimated using GIS analysis of 2010 census data. This information is provided in Table TU 3.12–4. Portions of the Tohono O'odham Nation are located under the Sells MOA/ATCAA, and portions of the San Carlos Apache Tribe are located under the Jackal and Outlaw MOAs/ATCAAs and the Rustler Airspace. These reservations contribute to a higher proportion of minority and low-income persons compared with the populations that underlie the other airspace units. Further discussion of these two tribes is provided in Section TU 3.9. No population centers are located under R-2301E; therefore, no further environmental justice analysis was conducted under this airspace unit.

Table TU 3.12–4. Populations of Concern Under the Primary Use Airspace

Airspace Units	*Counties Overflown*	*Affected Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
Jackal MOA/ATCAA	Apache, Arizona	40,382	24,369	60.3	12,275	30.4	12,601	31.2
	Gila, Arizona							
	Graham, Arizona							
	Navajo, Arizona							
	Pinal, Arizona							
Outlaw MOA/ATCAA	Gila, Arizona	42,045	19,322	46.0	7,919	18.8	8,879	21.1
	Maricopa, Arizona							
	Pinal, Arizona							
Ruby MOA/ATCAA	Pima, Arizona	7,691	5,124	66.6	1,148	14.9	2,132	27.7
	Santa Cruz, Arizona							
Rustler Airspace	Apache, Arizona	16,972	7,946	46.8	2,374	14.0	4,695	27.7
	Catron, New Mexico							
	Graham, Arizona							
	Grant, New Mexico							
	Greenlee, Arizona							
	Hidalgo, New Mexico							
Sells MOA/ATCAA	Maricopa, Arizona	8,623	7,344	85.2	3,026	35.1	2,546	29.5
	Pima, Arizona							
	Pinal, Arizona							
Tombstone MOA/ATCAA	Cochise, Arizona	33,227	22,881	68.9	9,934	29.9	8,480	25.5
	Hidalgo, New Mexico							
	Luna, New Mexico							
VR-263	Graham, Arizona	12,324	5,063	41.1	2,031	16.5	2,782	22.6
	Pima, Arizona							
	Grant, New Mexico							
	Hidalgo, New Mexico							
	Luna, New Mexico							

Source: USCB 2010a, 2010b, as analyzed using GIS.

As part of the environmental justice analysis, the minority, low-income, and youth populations are presented for the communities of comparison, which are represented by the counties and states in which the airspace is located. This information is presented in Table TU 3.12–5.

As discussed in Section TU 3.11.2.1, F-35A aircraft at Tucson AGS would use Libby AAF on Fort Huachuca as an auxiliary airfield for certain training events. Noise analysis conducted for Libby AAF of baseline flight operations and projected F-35A flight operations described in Section TU 3.2 show that the baseline and projected noise contours do not extend outside of the post boundaries of Fort Huachuca and do not affect off-post residents. Figures TU 3.2–4 through TU 3.2–6 present the noise contours for Libby AAF. Therefore, no additional analysis on environmental justice was conducted.

Table TU 3.12–5. Communities of Comparison Under the Primary Use Airspace

Community of Comparison	*Total Population (2010)*	*Minority*	*Percentage Minority*	*Low-Income*	*Percentage Low-Income*	*Youth*	*Percentage Youth*
Apache, Arizona	71,518	56,950	79.6	26,285	36.8	22,660	31.7
Cochise, Arizona	131,346	54,541	41.5	21,417	16.3	30,250	23.0
Gila, Arizona	53,597	18,299	34.1	10,333	19.3	11,471	21.4
Graham, Arizona	37,220	17,737	47.7	7,049	18.9	10,575	28.4
Greenlee, Arizona	8,437	4,383	51.9	1,253	14.9	2,463	29.2
Maricopa County, Arizona	3,817,117	1,577,062	41.3	509,685	13.4	1,007,861	26.4
Navajo, Arizona	107,449	60,268	56.1	26,459	24.6	31,973	29.8
Pima County, Arizona	980,263	438,563	44.7	154,185	15.7	225,316	23.0
Pinal County, Arizona	375,770	155,284	41.3	52,083	13.9	99,700	26.5
Santa Cruz, Arizona	47,420	39,856	84.0	10,472	22.1	14,560	30.7
Yuma County, Arizona	185,751	116,729	62.8	36,943	19.9	45,185	24.3
Arizona	6,392,017	2,696,370	42.2	941,594	14.7	1,629,014	25.5
Catron, New Mexico	3,725	893	24.0	437	11.7	590	15.8
Grant, New Mexico	29,514	15,158	51.4	4,425	15.0	6,473	21.9
Hidalgo, New Mexico	4,894	2,869	58.6	1,017	20.8	1,262	25.8
Luna, New Mexico	25,095	16,098	64.1	8,394	33.4	6,645	26.5
New Mexico	2,059,179	1,225,369	59.5	371,858	18.1	518,672	25.2

Source: USCB 2010a, 2010b.

TU 3.12.2.2 Airspace Environmental Consequences

Noise levels in the primary use airspace under all Tucson AGS F-35A aircraft scenarios would not result in disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or children living under the airspace because the affected populations are comparable to the community of comparison. Portions of the San Carlos Apache Tribe are located under the Outlaw MOA/ATCAA, Jackal MOA/ATCAA, and the Rustler Airspace, and portions of the Tohono O'odham Nation are located under the Sells MOA/ATCAA.

TU 3.13 Infrastructure

TU 3.13.1 Base

TU 3.13.1.1 Base Affected Environment

Potable Water System. The installation's potable water is provided by the City of Tucson distribution system, which receives its supply from more than 200 wells spread over five well fields with a collective pumping capacity of 196 million gallons per day (MGD). Tucson Water's total annual drinking and reclaimed water deliveries equal about 177 gallons of water per person per day (Tucson 2008). In FY2009, the installation's potable water consumption was less than 0.1 MGD (Air Force 2010).

Sanitary Sewer System. Wastewater generated at the base is discharged through the sanitary sewer system to the City of Tucson's public works system and Pima County's Roger Road Wastewater Treatment Plant. This plant is currently the largest facility in Tucson, with a capacity of 41 MGD (PCRWRD 2008). Tucson AGS has an average sewer discharge of less than 0.01 million gallons per month (Air Force 2010).

Storm Water Drainage System. A high percentage of the active administrative and industrial areas of the installation are paved or roofed and exhibit high runoff coefficients. Drainage of the built-upon area is by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. All storm water drainage systems on the installation discharge into the Airport Wash, which runs along the northern and northeastern boundaries of the installation. Airport Wash consists of a trapezoidal channel with concrete walls and an earthen bottom, and is roughly 100 feet wide by 10 feet deep.

Tucson receives about 12 inches of precipitation each year, with more than half of that total falling during the months of July through September and occurring as a result of monsoon systems—high-level winds and storms that occur as a result of atmospheric convection. Therefore, both the Airport Wash and the Santa Cruz River are dry much of the year. Storm water runoff that is not a result of monsoon weather reaches Airport Wash and infiltrates into the soil, recharging groundwater supplies.

Solid Waste Management. The 162 FW does not operate an onsite solid waste facility (landfill). All solid waste is collected and transported off site for disposal. Off-base contractors completing any demolition and construction projects at the 162 FW installations would be responsible for disposing of waste generated from these activities.

Electrical System. Electricity is provided to the installation by Tucson Electric Power Company. In FY2009 Tucson AGS consumed nearly 11.5 million kilowatt-hours of electricity.

Natural Gas System. Natural gas is provided to the installation by Southwest Gas Company, and just over 100,000 CCF (hundreds of cubic feet) of natural gas was consumed in FY2009 (Air Force 2010).

TU 3.13.1.2 Base Environmental Consequences

Potable Water System. Under the F-35A aircraft scenarios, the largest net change in personnel associated with the change in mission would be an increase of approximately 926 personnel (including dependents); this would occur under Scenario T3. Tucson Water's total annual drinking and reclaimed water deliveries equal about 177 gallons of water per person per day, with the installation's potable water consumption less than 0.1 MGD. A maximum increase of 926 persons utilizing potable water in the local community would not be significant compared with the baseline/no action consumption amounts. The percentage of potential increases in potable water usage and wastewater generation over baseline levels under Scenarios T1 through T3 is presented in Table TU 3.13–1.

Table TU 3.13–1. Percentage of Potential Increases in Potable Water/Wastewater

Aircraft Scenario	*Net Personnel Change (Including Dependents)*	*Volume of Water (Potable Water and Wastewater) Per Day (gallons)*		*Percentage of Potable Water Use Increase Over Baseline Conditions*	*Percentage of Wastewater Generation Increase Over Baseline Conditions*
		Potable Water	**Wastewater**	**Potable Water**	**City WWTP**
Scenario T1 (24 Aircraft)	(493)	–	–	–	–
Scenario T2 (48 Aircraft)	509	90,093	35,630	< 1	< 1
Scenario T3 (72 Aircraft)	926	163,902	64,820	< 1	< 1

Note: (Number) denotes a negative number.

Sanitary Sewer System. The EPA estimates that the average person generates approximately 70 gallons of wastewater per day between showering, toilet use, and general water use (EPA 2005). Utilizing a 70-gallon-per-day generation rate, it was estimated that the additional personnel associated with the largest potential increase in personnel (under Scenario T3) would produce approximately 64,820 gallons of wastewater per day. This is an insignificant amount when compared to the current capacity of the Pima County's Roger Road Wastewater Treatment Plant (41 MGD).

Storm Water Drainage System. Surface-water runoff from the installation and TUS is directed to Airport Wash through a series of storm sewers, which flow north and northwest and discharge at Airport Wash. The 162 FW has implemented a Storm Water Pollution Prevention Plan (Arizona ANG 2006) to deal with any impacts that may occur with the implementation of Scenario T1, T2, or T3. These scenarios would not impact the storm water drainage system.

Solid Waste Management. Off-base contractors completing any demolition and construction projects at the 162 FW installation would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with Federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled, reused, or otherwise diverted from landfills. All non-recyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste, including waste contaminated with hazardous waste,

asbestos-containing material (ACM), lead-based paint (LBP), or other undesirable components, would be managed in accordance with Air Force Instruction (AFI) 32-7042, *Waste Management* (Air Force 2009b). Thus, only minor impacts on the solid waste management system at the 162 FW installation are anticipated due to the proposed demolition and construction. Solid waste generated by the additional personnel associated with Scenarios T1, T2, and T3 would be transported off site.

Electrical System. The demand for energy (primarily electricity) would increase during the demolition, construction, or operational phases under all of the F-35A aircraft scenarios. The Air Force has estimated that electrical use for 175,400 square feet of new or modified operations, training, and maintenance facilities would be 3,315,440 kilowatt-hours annually. To estimate the electrical use associated with personnel and their dependents, data from the U.S. Energy Information Administration (2010) were used to identify that consumers averaged about 13,140 kilowatt-hours per person (2,528,405 users) in Arizona in 2008 (the best available statistics), with a total of about 33,223,241,700 kilowatt-hours consumed. At a maximum potential increase of 926 additional people under Scenario T3, a potential increase of about 12,167,640 kilowatt-hours of electricity can be anticipated. This represents less than 1 percent of total usage in 2008. Even under an optimal usage scenario, this increase is very small and not significant; scenarios of less than 72 aircraft are expected to result in fewer impacts. In addition, the Air Force expects increases in electrical use associated with new facilities to be minimal, given LEED [Leadership in Energy and Environmental Design] requirements for energy efficiency. The electrical energy supply grid at Tucson AGS is adequate and would not be affected.

Natural Gas System. It is not anticipated that natural gas consumption would increase during the demolition and construction phases of the F-35A aircraft scenarios. As additional heated working and administrative spaces are developed and operations increase under the F-35A aircraft scenarios, the Air Force estimates that natural gas consumption could increase by 6,262,500 cubic feet. However, as with electrical consumption estimation, several variables that are not yet known affect consumption estimations. For residential consumption estimations, according to the U.S. Energy Information Administration (USEIA 2010), approximately 1,128,264 residential consumers in Arizona used about 34,905 million cubic feet of natural gas in 2009. This equates to an average of about 0.03 million cubic feet per person per year. Under Scenario T3, the largest potential increase in people would be 926. Assuming all persons use natural gas, which is unlikely, the greatest potential increase in consumption would be approximately 28 million cubic feet annually. This equates to an increase of less than 1 percent in natural gas usage, with this number likely being much less. Even under an optimal usage scenario, this increase is very small and not significant; scenarios of less than 72 aircraft are expected to result in fewer impacts.

TU 3.14 Transportation

TU 3.14.1 Base

TU 3.14.1.1 Base Affected Environment

Regional Access. Regional access to TUS and Tucson AGS is provided by Interstate 10 and 19. Interstate 10, approximately 2 miles north of Tucson AGS, continues west to its terminus in Los Angeles and east through Arizona, New Mexico, Texas, and the Gulf states to an eastern terminus in Jacksonville, Florida. Interstate 19, approximately 1.5 miles west of Tucson AGS, reaches its northern terminus when it intersects with Interstate 10, approximately 3.5 miles northwest of the installation, and continues south to Nogales and the international border with Mexico. TUS is bounded by the Nogales Highway to the west and Valencia Road to the north. Primary access to the airport is obtained via Tucson Boulevard, which enters to the north from Valencia Road. Direct access to Tucson AGS is also provided by Valencia Road.

Tucson AGS is located in the northern portion of TUS. TUS is a one-terminal, multi-concourse, three-runway facility serving 15 cities by way of nine commercial carriers, including Alaska Air, American, Continental, Delta, Frontier, Southwest, Sun County, United, and US Airways. The airport averaged 60 daily departures and arrivals in 2009 and provides linkage to several large transportation hubs, including Los Angeles, Las Vegas, San Diego, Denver, Dallas, and Chicago (Tucson Airport 2010).

Public transportation, consisting of a fleet of over 240 buses, is provided to the city of Tucson by Sun Tran. Five separate Sun Tran lines provide direct access to TUS (Sun Tran 2009). Amtrak offers regional passenger rail service to Tucson via the Sunset line, which runs from New Orleans to Los Angeles (Amtrak 2009).

Gate Access. There is only one access gate to Tucson AGS, located on Perimeter Way, which connects to the installation via Valencia Road to the north.

On-Installation Circulation. Perimeter Way is the primary road located on Tucson AGS. Several other collector streets provide access to facilities on the installation. Future development plans are in the initial stages for land acquisition on the western portion of the installation, including new facility construction, renovation, and reconfiguration of existing traffic circulation (Arizona ANG 2009).

TU 3.14.1.2 Base Environmental Consequences

Construction-Related Impacts. Implementation of any of the three scenarios (T1, T2, or T3) would require delivery of materials to and removal of construction-related debris from construction and renovation sites. However, construction traffic would make up only a small portion of the total existing traffic volume in the area and at the installation. Increased traffic during construction could contribute to degradation of the internal road surfaces, additional congestion at the main gate, and delays in the processing of access passes. The potential for short-term increases in traffic are not likely to substantially affect commute times. No long-term impacts on on- or off-base transportation systems would result.

Operations. Under Scenario T1, approximately 67 personnel would be added to support the F-35A, resulting in a 3 percent increase in full-time personnel and a similar increase in daily commuting traffic to and from Tucson AGS. In addition to the increase in personnel, there would be a small increase in dependent and commercial traffic. This assumes that all personnel and dependents live off base, work standard workdays, and drive individually to the installation. This scenario could result in a small increase in the amount of vehicles passing through the main gate during the morning and evening workday rush hours. Therefore, implementation of Scenario T1 would be accommodated with these changes without increased congestion of the local transportation system.

If Scenario T2 is selected, ANG personnel would increase by approximately 200, resulting in a 10 percent increase in full-time personnel reporting to work each day. This increase would result in a similar percentage increase in daily commuting traffic to and from Tucson AGS. In addition to the increase in personnel, there would be a small increase in dependent and commercial traffic. This assumes that all personnel and dependents live off base, work standard workdays, and drive individually to the installation. This scenario could result in an increase in the congestion at the main gate during the morning and evening workday rush hours. The installation may adjust the schedule of operations to accommodate this increase. Therefore, implementation of Scenario T2 would be accommodated with these changes without increased congestion of the local transportation system.

With the selection of Scenario T3, ANG personnel would increase by approximately 351 personnel, resulting in an 18 percent increase in full-time personnel reporting to work each day. This increase would result in a similar percentage increase in daily commuting traffic to and from Tucson AGS. In addition to the increase in personnel, there would also be a small increase in dependent and commercial traffic. This scenario would result in a noticeable increase in the congestion at the main gate during the morning and evening workday rush hours. The installation would adjust the schedule of operations to accommodate this increase and would provide additional personnel at the gate to process security checks during the peak hours. Therefore, implementation of Scenario T3 would be accommodated with these changes without increased congestion of the local transportation system.

TU 3.15 Hazardous Materials and Waste

TU 3.15.1 Base

TU 3.15.1.1 Base Affected Environment

Hazardous Materials and Waste. Operations conducted at the 162 FW installation require the use and storage of hazardous materials. These activities include the following:

- Aircraft refueling.
- Aircraft maintenance – The bulk of this maintenance is performed inside various buildings on the base, but some routine daily maintenance is performed outside on the aircraft aprons. These operations included the routine usage of lubricating oil, degreasers, solvents, and other hazardous materials.
- Aircraft washing.

- Vehicle maintenance and washing.
- Distribution and management of petroleum, oils, and lubricants.
- Facility maintenance and repair.
- Maintenance of ground support equipment.
- Aircraft support operations, including maintenance and repair of equipment related to avionics, communications, radar, weapon systems, etc.

Hazardous materials historically used in these types of activities include fuels and lubricating oils, chlorinated solvents and other solvents/degreasers, paints and thinners, antifreeze and de-icing compounds, and acids.

The implementation of an Installation Hazardous Materials Program in 2004 has resulted in significant changes in hazardous substance storage at the 162 FW installation. While hazardous substance storage sites, including hazardous waste Satellite Accumulation Points and flammables cabinets, remain in many locations around the installation, the quantities of materials held at any site have been vastly reduced. Hazardous substances are issued from the hazardous materials pharmacy (HAZMART) to personnel only in small quantities, and personnel are expected to return unused portions routinely to the HAZMART.

The 162 FW installation is currently regulated as a small-quantity generator of hazardous waste (EPA ID No. AZ9573124055). Hazardous and petroleum wastes are currently generated throughout Tucson AGS during various industrial operations. Hazardous and petroleum wastes generated by the 162 FW include used oil and filters, used antifreeze, used solvent, reclaimed Jet Propellent-8 jet fuel, waste Jet Propellent-8 and fuel filters, wastewater, waste paint and solvents, waste corrosives and batteries, and waste alcohol. The 162 FW operates a 180-day Central Accumulation Point (CAP) for storage of hazardous waste prior to transportation and disposal off the property, coordinated through the Defense Reutilization and Marketing Office located at Davis-Monthan AFB, Arizona. The CAP is located at the southeastern corner of Building 9 and is collocated with the HAZMART. The HAZMART/CAP area consists of a fenced-in, self-contained, paved area with several self-contained hazardous-materials-storage lockers. Hazardous wastes are stored inside three of the storage lockers at all times. In addition to the CAP, the 162 FW uses 12 hazardous waste Satellite Accumulation Points, where hazardous waste is stored in amounts up to 55 gallons at or near the point of generation. Once the volume limit is reached, containers are transported to the CAP. There are 10 waste oil or used oil accumulation sites, where 55-gallon drums or up to 3,000 gallons of used oil and used Jet Propellent-8 may be stored until they are picked up and recycled by a local contractor.

National Priorities List/Environmental Restoration Program Sites. The National Priorities List is the EPA list of uncontrolled or abandoned hazardous waste sites identified for priority remedial actions under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986. A site must meet or surpass a predetermined hazard ranking score, be chosen as a state's top priority site, or meet three specific criteria set jointly by the U.S. Department of Health and Human Services and the EPA to become a National Priorities List (or Superfund) site.

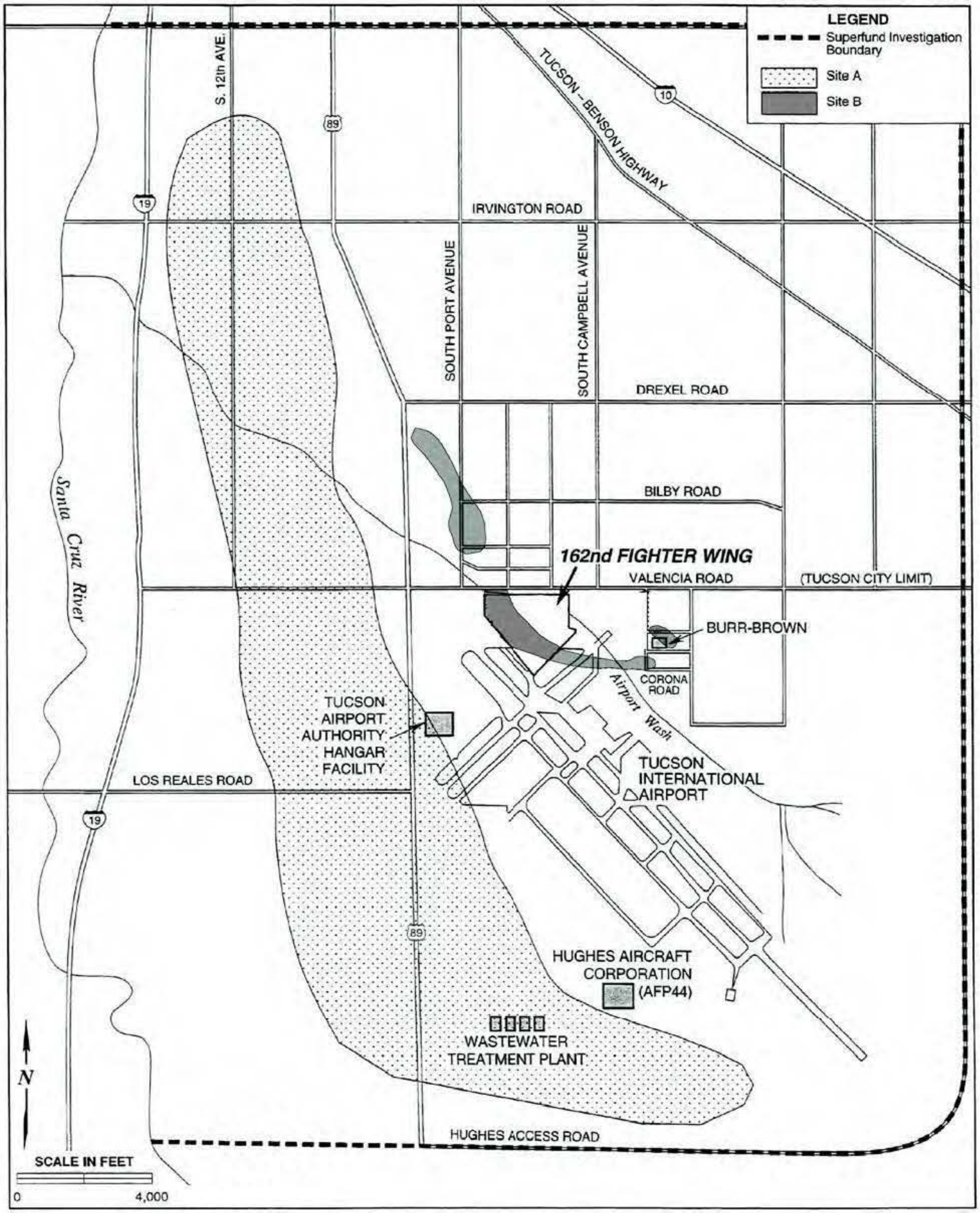
The Environmental Restoration Program (ERP) is the basis for response actions at the installation property under the provisions of Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act. The 162 FW began conducting activities under the ERP program in April 1987, and a Preliminary Assessment was completed in October 1987. Eight ERP sites were identified in the October 1987 Preliminary Assessment Report (162 FW 2006), and additional investigations were recommended for all of these ERP sites. All investigations have been completed, and all ERP sites have been closed.

In addition, the 162 FW installation is part of the TIAA Superfund site. The EPA directed sampling conducted at Air Force Plant 44, and an area 4 miles north of the 162 FW base revealed the prevalence of VOCs in groundwater, including TCE, dichloroethylene, trichloroethane, chloroform, benzene, xylene, and chromium. All contaminated municipal wells were disconnected from the potable water system in the early 1980s.

The TIAA site covers 24 square miles and is divided into two main areas (see Figure TU 3.15–1). The main portion of the site, designated "Area A" or "Plume A," extends from south of the airport to the northwest along the western boundary of the airport. A smaller area, believed to be separate from Area A (i.e., contaminated by different sources), is located just north of the airport and is referred to as "Area B" or "Plume B." Of the two sites, only Area B encompasses the 162 FW installation.

In 1987, the EPA designated the 162 FW installation as a potentially responsible party for the TIAA Area B contamination. As part of investigations conducted under the Installation Restoration Program, TCE was discovered in the groundwater samples taken from Installation Restoration Program Sites 4, 5, and 7 at levels ranging from non-detectable to 46 micrograms per liter. The EPA maximum contaminant level for TCE in drinking water is 5 micrograms per liter. This TCE contamination is currently being addressed through use of a Groundwater Extraction, Treatment, and Recharge System (GWETRS) in place on the base. As of December 2005, a total of approximately 485-million gallons of groundwater had been treated, resulting in the removal of approximately 28 pounds of TCE (162 FW 2006). Operation and maintenance of the GWETRS is tentatively scheduled through May 2017.

Toxic Substances. AFI 32-1052 (Air Force 1994) establishes requirements and assigns responsibilities to incorporate facility asbestos management principles and practices. Installations must remove ACM likely to release airborne asbestos fibers that cannot be reliably maintained, repaired, or isolated. All facilities must be monitored closely to ensure that ACM does not become airborne. In addition, each installation must develop a written management and operating plan to carry out the objectives of facility asbestos management. An asbestos survey for the 162 FW was performed in 1994 and again in 2002, and is updated continuously as ACM is abated.



Source: Arizona ANG 2003.

Figure TU 3.15–1. TIAA Superfund Site Map

In 1973, the Consumer Products Safety Commission established a maximum lead content in paint of 0.5 percent by weight in a dry film of paint newly applied. In 1978, the Consumer Products Safety Commission lowered the allowable lead level in paint to 0.06 percent. *Air Force Policy and Guidance on Lead-Based Paint in Facilities*, referenced in Air Force Handbook 32-9007 (Air Force 1999), requires Air Force installations to identify, evaluate, control, and eliminate existing LBP hazards and past LBP hazards where potential LBP debris may have accumulated in the area surrounding facilities. Priority is given to facilities or portions of facilities frequented by children. All installations must develop and implement a plan for identifying, evaluating, managing, and abating LBP hazards. The guidance emphasizes the use of in-place management and LBP abatement as part of the normal facility renovation and upgrade programs when it is cost effective.

Most of the 162 FW installation buildings are painted, and this paint appears to be in good condition. A lead paint survey has not been conducted within the 162 FW installation. However, all buildings on the 162 FW installation constructed prior to 1978 are presumed to contain LBP and are tested for it prior to demolition or renovation.

TU 3.15.1.2 Base Environmental Consequences

Hazardous Materials and Waste. With the implementation of Scenario T1, T2, or T3, the quantities of hazardous materials and petroleum substances used throughout the 162 FW installation would not change significantly in the long term. Short-term increases in the quantities of hazardous materials and petroleum substances would be realized in terms of the quantity of fuel stored and used during construction activities because various fuels (e.g., diesel, gasoline) would be required to run earthmoving equipment and power tools and to provide electricity and lighting as conditions warrant. In addition, the number of sites storing, using, and handling hazardous materials may change slightly with the implementation of Scenario T1, T2, or T3; however, the authorization process already in place for the acquisition of these materials would ensure that only the specific types and quantities necessary to carry out the mission would be brought to the 162 FW installation.

The quantity of hazardous waste generated at the 162 FW installation is not expected to increase beyond the current quantities with the implementation of Scenario T1, T2, or T3 and the installation would remain a small-quantity generator pursuant to the Resource Conservation and Recovery Act. If any new hazardous waste generation or handling areas (e.g., Satellite Accumulation Points or CAPs) are established as a result of Scenario T1, T2, or T3, they would be managed in accordance with the installation's Hazardous Waste Management Plan, which would be updated to reflect the changes.

National Priorities List/Environmental Restoration Program Sites. Facilities associated with Scenarios T1, T2, or T3 could be located above the groundwater contamination plume associated with the TIAA site, but not disturb any monitoring, extraction, or injection wells or equipment associated with the GWETRS on installation (see Figure TU 3.15–2). Due to the depth of the groundwater contamination (approximately 80 feet below ground surface), the contamination plume would not be affected by any construction excavation activities. Several buildings at the 162 FW installation are currently located above the plume with no adverse impact.

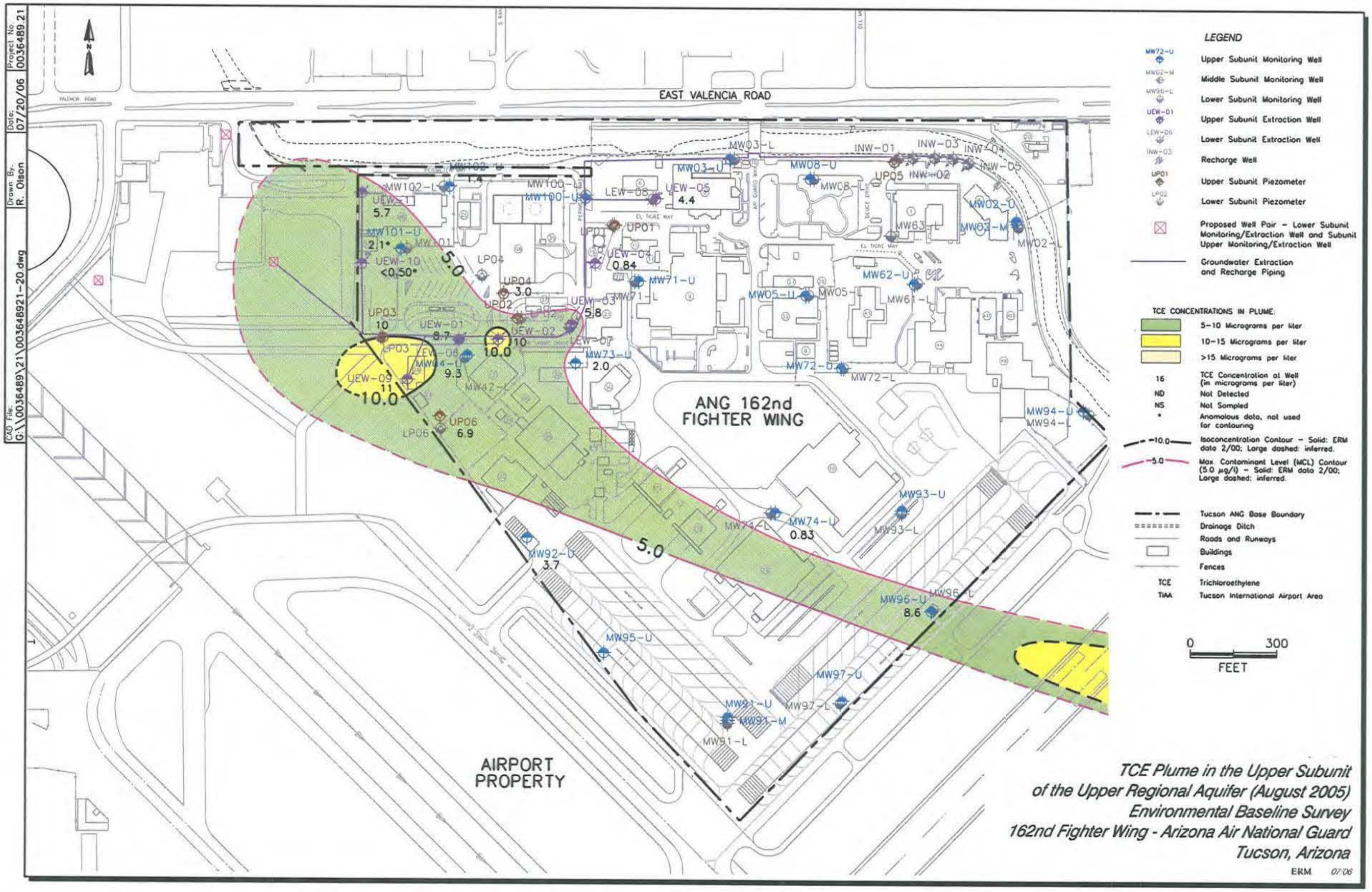


Figure TU 3.15–2. TIAA Superfund Plume within Installation Map

Toxic Substances. Prior to any demolition associated with the implementation of Scenario T1, T2, or T3, surveys would be conducted to determine the presence of ACMs. If ACMs are present, the 162 FW installation would employ appropriately trained and licensed contractors to perform the ACM removal work and would notify the contractors of the presence of ACMs so that appropriate precautions could be taken to protect the health and safety of the workers. ACMs would be segregated for disposal and managed in accordance with applicable Federal, state, and local regulations.

Prior to any demolition associated with the implementation of Scenario T1, T2, or T3, surveys would be conducted to determine the presence of LBP. If LBP is present, the 162 FW installation would employ appropriately trained and licensed contractors to perform work involving the LBP and would notify the contractor of the presence of LBP so that appropriate precautions could be taken to protect the health and safety of the workers.

TU 4.0 Tucson AGS Cumulative Effects and Irreversible and Irretrievable Commitment of Resources

Council on Environmental Quality regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person (Federal or non-Federal) undertakes such other actions" (40 CFR 1508.7). In this section, an effort has been made to identify past and present actions in the Tucson AGS region and those reasonably foreseeable actions that are in the planning phase or unfolding at this time. Actions that have a potential to interact with the beddown of F-35A at Tucson AGS are included in this cumulative analysis. This approach enables decisionmakers to have the most current information available so that they can evaluate the environmental consequences of the beddown of F-35A aircraft at Tucson AGS, use of the auxiliary airfield at Libby AAF, and training in associated airspace.

Tucson AGS is an active military installation that undergoes changes in mission and in training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the installation requires new construction, facility improvements, infrastructure upgrades, and other maintenance/repairs on a nearly continual basis. Although known construction and upgrades are a part of the analysis contained in this document, some future requirements cannot be predicted. As those requirements surface, future NEPA analysis will be conducted, as necessary.

TU 4.1 Past, Present, and Reasonably Foreseeable Actions

In the early 1980s, the 162 FW at Tucson AGS transitioned from training pilots on F-100 to A-7D aircraft, adding the A-7 Fighter Weapons School. In the late 1980s, the 162 FW began training pilots from the Royal Netherlands Air Force. Tucson AGS expanded its international mission through the 1990s, training pilots from numerous countries, including Belgium, Greece, Israel, Japan, Norway, Portugal, the Republic of Singapore, Thailand, and Turkey. In 1997, the 162 FW began training international maintenance technicians on F-16 systems. In June 2004, the 162 FW and the United Arab Emirates (UAE) initiated a training program and established one

dedicated F-16 squadron at Tucson AGS, the 148th Fighter Squadron. The UAE F-16 squadron departed Tucson AGS in 2010. The Royal Netherlands Air Force has begun training with Tucson AGS, bringing 12 F-16s to the installation and offsetting the departure of the UAE training squadron. The 162 FW has recently or is currently training pilots from Israel, Italy, Chile, and Taiwan.

Table TU 4.1–1 summarizes past, present, and reasonably foreseeable actions within the region that could interact with the beddown of F-35A at Tucson AGS. The table briefly describes each identified action, presents the proponent or jurisdiction of the action and the timeframe (e.g., past, present/ongoing, future), and indicates which resources potentially interact with the beddown of F-35A at Tucson AGS. Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the region surrounding Tucson AGS and training airspace.

TU 4.2 Cumulative Impacts

The following analysis considers how the impacts of the actions in Table TU 4.1–1 might affect or be affected by the F-35A beddown scenarios at Tucson AGS. The analysis considers whether such a relationship would result in potentially significant impacts not identified when the beddown of F-35A at Tucson AGS is considered alone.

Tucson AGS. Implementation of the proposed Tucson AGS Area Development Plan would increase the amount of construction occurring at the base over the next several years. Acquisition of parcels would provide more options for siting new facilities and improving the logistical arrangement of functions on the base. Relocating the main entry gate would greatly benefit access and alleviate potential traffic congestion during peak arrival times. Placement of new structures (particularly in the proposed acquisition parcels) would require coordination with the TAA to ensure that safety setbacks and Clear Zones are not compromised. Sound engineering and management practices would minimize impacts of cumulative construction proposals on the base and airport. Additional impervious surface on the installation would require installation of appropriate storm water system improvements.

The ongoing Part 150 update for TUS is anticipating a smaller footprint exposed to noise levels of 65 dB and greater, based on quieter engines in new aircraft and slower growth in civilian operations than previously projected. The ongoing modeling reflects a continuation of the current F-16 military mission. Approval and adoption of a changed and smaller Part 150 footprint may allow changes in land use controls by affected jurisdictions. This situation could lead to future encroachment of incompatible development around the airfield. Integration of the proposed F-35A operations as an alternative in the updated Part 150 study would provide a basis for adopting a revised footprint that ensures flexibility and compatible decisions for long-term joint use at the airfield. The Pima County Board of Supervisors has also recommended and approved the acquisition of 382 acres south of Tucson International Airport. If completed, the land acquisition would serve as a buffer to the airport and reduce encroachment along that airport boundary.

Table TU 4.1–1. Past, Present, and Reasonably Foreseeable Actions at Tucson AGS and Associated Region

Action	***Proponent/Location***	***Timeframe***	***Description***	***Resource Interaction***
Military Actions				
Tucson AGS Area Development Plan	162 FW	Future	Construction and demolition for improvements to current base layout, relocation of entry gate, relocation of munitions storage area, new facilities and renovation, holding apron. Includes acquisition of 22.7-acre, 5.4-acre, and 7.4-acre parcels for redevelopment plans. Disturb about 7 acres from short- to long-range timeframe.	Safety, Soil Resources, Transportation, Water Resources at the installation.
UAE pilot training program departing Tucson AGS	UAE	Present	UAE left Tucson AGS in December 2010 with 13 Block 60 F-16 aircraft. UAE had trained with the 162 FW since June 2004. This will result in a reduction in flight operations at the airfield and in training airspace.	No change (in combination with arrival of Royal Netherlands Air Force).
Royal Netherlands Air Force pilot training program arriving at Tucson AGS	Royal Netherlands Air Force	Present	The Royal Netherlands Air Force has announced that it will train with the 162 FW at Tucson AGS and will bring 12 F-16s. The total program will provide 3,000 flying hours per year. The transition from the UAE to Dutch training programs began in October 2010. This action offsets the departure of the UAE.	No change (in combination with UAE Air Force departure).
Environmental Assessment for the West Coast Combat Search and Rescue (CSAR) Beddown, 2002	HQ ACC, Davis-Monthan AFB	Past	Beddown of three squadrons, composed of HH-60 helicopters, HC-130 fixed-wing aircraft, and Combat-Rescue officers, to conduct combat search and rescue training. Training is conducted in Sells Low MOA, Jackal Low MOA, BMGR East, Yuma Tactical Aircrew Combat Training System Range, nearby Low Altitude Tactical Navigation areas, and overwater training areas. The Environmental Assessment included evaluation of Operation Snowbird.	Represented in baseline conditions.
Environmental Assessment for Recapitalization of the 49th WG Combat Capabilities and Capacities, Holloman Air Force Base, New Mexico	Air Education and Training Command, Holloman AFB, Luke AFB	Present	Air Education and Training Command is implementing the relocation of the F-16 training mission from Luke AFB, Arizona, to Holloman AFB, New Mexico. The relocation of the F-16 training mission is expected to occur in FY2013.	Airspace Management and Use, Noise, Air Quality.

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions (continued)				
Environmental Assessment for the Implementation of National Guard Bureau's Training Plant (TP) 60-1, Operation Snowbird	HQ ACC, Davis-Monthan AFB	Present, future	The environmental assessment evaluates the number of sorties and aircraft types conducted by Operation Snowbird. The No Action Alternative is the level of operations from the 2002 CSAR Beddown EA. The action alternatives include increasing the number of sorties and adding new aircraft types, including U.S. and foreign aircraft such as F-22s, F-18E/F, Tornadoes, Typhoon, and Kfir. Training operations would be conducted at Davis-Monthan AFB and Outlaw, Jackal, Reserve, Morenci, Tombstone, and Sells MOAs, as well as BMGR East. This environmental assessment is currently being developed.	Airspace Management and Use, Noise, Air Quality.
Proposed Transition to F-16 Block 32 at Tucson AGS, Arizona	ANG, Tucson AGS	Present, future	The F-16 Block 25 aircraft currently assigned to Tucson AGS are coming to the end of their operational lifespan. ANG proposes to replace the Block 25 aircraft with Block 32 aircraft in a one-for-one exchange. The F-16 Block 32 aircraft would operate at Tucson AGS and in the airspace in the same manner as the F-16 Block 25 aircraft do currently.	Noise, Air Quality.
United States Marine Corps Joint Strike Fighter F-35B West Coast Basing Environmental Impact Statement	U.S. Navy, USMC	Future	The USMC is considering the basing of the F-35B at MCAS Yuma, Arizona. If based on MCAS Yuma, the F-35B is proposed to use BMGR and other airspace units in the vicinity of Luke AFB and Tucson AGS.	Airspace Management and Use, Noise, Air Quality.
Proposed Range Enhancements for Barry M. Goldwater Range East EIS	Air Force	Present, future	This EIS addresses several range projects that add new target area for air-to-ground missiles, mobile vehicle targets, reconfiguration of existing range for helicopter training, new sensor training area, improvements of ground training exercises, infrastructure and road improvements, and lowering of operational airspace floor to 500 feet AGL over Cabeza Prieta NWR, and new taxiway and air traffic control tower at Gila Bend AFAF.	Airspace Management and Use, Noise, Land Use at auxiliary airfield and in training airspace.

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions (continued)				
Environmental Assessment for MQ-1 Predator Beddown at Fort Huachuca	ANG	Present, future	Action to construct Launch and Recovery Element Complex on south side of airfield and perform about three unmanned air system sorties per week with about 170 hours of pattern work at the airfield, about 1,300 hours in restricted airspace around Libby AAF, and about 250 hours in BMGR restricted airspace annually.	Airspace Management and Use.
Programmatic EA Future Development Plan, U.S. Army Intelligence Center, Fort Huachuca	U.S. Army Garrison, Fort Huachuca	Past	Evaluated changes in U.S. Army Intelligence Center test and training functions, including UAS operations at Libby AAF and restricted airspace.	Airspace Management and Use.
Non-Military Federal				
Sierra Vista/Libby Field Airport Master Plan	Sierra Vista Municipal Airport	Present, future	Stage development of airport facilities primarily to better serve general aviation and commercial functions. Near-term new general aviation runway and additional aprons for fixed-base operator; future general aviation terminal and parking, taxiway, and pavement improvements.	Airspace Management and Use.
Western Renewable Energy Zones-SunZia Transmission Study Corridor and EIS	Western Governors' Association and U.S. Department of Energy	Future (long range)	Establish about 500-mile, 500-kilovolt transmission line from central New Mexico to south–central Arizona. Towers up to 160 feet in height. Several alignments considered in wide study corridor.	Airspace Management and Use.
Yuma Resource Management Plan and EIS	BLM Yuma Field Office	Present, future	Addresses several surface management actions, such as grazing, physical improvements, recreational access, and special management areas. Includes a decision that new wind farms would not be sited underneath MTRs.	Land Use, Recreation in training airspace.
State and Local				
Tucson International Airport Part 150 Program Update	Tucson Airport Authority	Present	Ongoing Part 150 process and anticipating a reduction in noise exposure for the airport based on reduced levels of civil and commercial operations and quieter engines in newer aircraft. Current study assumes F-16 mission remains in place.	Noise, Land Use, Environmental Justice at the installation.

The proposed transition of Tucson AGS from the F-16 Block 25 to the F-16 Block 32 is not anticipated to create cumulative impacts with the proposed F-35A beddown. The transition would include a one-for-one exchange between the Block 25 and Block 32 aircraft so no additional sortie-operations would be conducted within the training airspace. Additionally, the Block 25 and Block 32 use the same engine; therefore, noise parameters and air emissions between the two block types would be the same.

Auxiliary Airfield. Recent proposals address UAS operations at Libby AAF and surrounding restricted airspace and established appropriate airspace procedures and protocols. With these in place, the addition of pattern work by F-35A aircraft at Libby AAF, along with civilian commercial and general aviation operations, is compatible, although increased use would add to the air traffic control responsibilities. Implementation of the airport's master plan would benefit safe and efficient ground operations of the non-military traffic, improving the joint use function of the airfield over time. Cumulative operations would therefore be manageable. General aviation and UAS aircraft would generate some noise, but represent a minor cumulative source of noise. The F-35A aircraft would represent a major driver of the noise effects at the airfield (see Section TU 3.2). The airspace management and use, noise, and land use evaluations in this EIS address the effects of combined operations at the airfield.

Training Airspace. Potential training in R-2301E and the TAC training areas on BMGR may be higher than evaluated if Luke AFB receives F-35A aircraft, if Tucson AGS receives F-35A aircraft and Luke AFB continues baseline operations, if MCAS Yuma receives the F-35B aircraft, and/or if Operation Snowbird increases the number of operations. Combined aircraft training from the different locations and the proposed lowering of the floor of R-2301E over Cabeza Prieta NWR could cause increases in noise that are not compatible with conservation of wildlife. However, noise over this area is part of the existing context to which wildlife has adapted. Current proposals that would expand the capabilities of BMGR East, if approved, would likely increase use of restricted airspace over BMGR by various Air Force units at Luke AFB and transient users. In combination with additional F-35A operations from Tucson AGS and possibly Luke AFB, as well as increased operations from Operation Snowbird, future operational levels could increase noise levels beyond those evaluated in this EIS. The F-35B aircraft proposed for MCAS Yuma would use BMGR as one of the primary training ranges. BMGR West is scheduled by the USMC, while BMGR East is scheduled by the Air Force. However, the F-35B is proposed to replace legacy aircraft, and the net change in training operations in BMGR East would decrease compared with baseline levels. Continued coordination between MCAS Yuma and the Air Force users would be necessary to schedule use of BMGR East amongst the various users of the range. For the airspace units controlled by Tucson AGS, coordinated scheduling between the 162 FW and Operation Snowbird units would ensure that all users are able to utilize the airspace for required training.

Since public use of BMGR is already restricted due to incompatibility with military uses, potential to impact public uses and recreation is relatively low. As with the combined use of BMGR East, the combined use of the Tucson AGS airspace units from the Tucson AGS F-35A and Operation Snowbird units may result in an increase in noise levels beyond those evaluated in this EIS. Effects on wildlife and cultural resources in BMGR East and the Tucson AGS airspace units would be similar to those described in this EIS, but potentially with a higher degree of impact.

In general, the resource management actions by the various Federal land managers and tribal entities are implemented on the ground and would not overlap with the use of regional airspace. However, some projects could interact and require local coordination, such as controlled burning, which can cause localized smoke that could be hazardous to high-speed military flying operations. The planning and siting of future tall structures, such as transmission lines, wind farms, and communication towers, pose compatibility concerns for low-altitude flight operations, particularly in MTRs. Several ongoing and proposed Resource Management Plans could approve new SULMAs with conservation and recreational values. Noise impacts on these areas may be inconsistent with conservation-oriented management goals. Nonetheless, impacts would be similar to those described in EIS resource sections (such as Land Use and Recreation, Wildlife, and Cultural Resources). A military airspace regional coordinator could serve as a representative to assist with mutually compatible long-term sustainable solutions between responsible Federal agencies.

TU 4.3 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For the beddown of F-35A aircraft at Tucson AGS, most resource commitments are neither irreversible nor irretrievable. Most impacts are short term and temporary, such as air emissions from construction, or longer lasting but negligible, such as public service increases. Increases in sonic booms would not be negligible. However, the duration of individual booms would be extremely brief. Those limited resources that may involve a possible irreversible or irretrievable commitment are discussed below.

If Tucson AGS is the chosen beddown location, some land in the cantonment would be disturbed. Much of this land has been previously disturbed and is heavily influenced by airfield development. Construction and renovation of base facilities would require the consumption of limited amounts of material typically associated with interior renovations (wiring, insulation, windows, drywall) and exterior construction (concrete, steel, sand, brick). An undetermined amount of energy to conduct renovation, construction, and operation of these facilities would be expended and irreversibly lost.

Training operations would continue and would involve consumption of nonrenewable resources, such as gasoline used in vehicles and jet fuel used in aircraft. None of these activities are expected to significantly decrease the availability of minerals or petroleum resources. POV use by the personnel continuing to support the existing missions would consume fuel, oil, and lubricants. The amount of these materials used would increase slightly; however, this additional use is not expected to significantly affect the availability of the resources.

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29 CFR 1926 – Occupational Safety and Health Administration, Department of Labor

32 CFR 989 – Environmental Impact Analysis Process (EIAP)

36 CFR 60 – National Register of Historic Places

36 CFR 63 – Determinations of Eligibility for Inclusion in the National Register of Historic Places

36 CFR 79 – Curation of Federally Owned and Administered Archaeological Collections

36 CFR 800 – Protection of Historic Properties

40 CFR 50 – National Primary and Secondary Ambient Air Quality Standards

40 CFR 93 – Determining Conformity of Federal Actions to State or Federal Implementation Plans

40 CFR 261 – Identification and Listing of Hazardous Waste

40 CFR 1500–1508 – Council on Environmental Quality; Regulations for Implementing NEPA

43 CFR 7– Protection of Archaeological Resources

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Aviation Safety and Noise Abatement Act of 1979 (P.L. 96-193; codified at 49 U.S.C. §§47501-47510)

Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. § 668-668d)

Clean Air Act of 1963 as amended (P.L. 88-206, 77 Stat. 392; 42 U.S.C. § 7401)

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Endangered Species Act of 1973 (P.L. 93–205, 87 Stat. 884 ;16 U.S.C. §§ 1531–1544, as amended)

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NEPA
Disclosure Statement

NEPA DISCLOSURE STATEMENT FOR THE F-35A TRAINING BASING ENVIRONMENTAL IMPACT STATEMENT

The Council on Environmental Quality (CEQ) Regulations at Title 40 of the *Code of Federal Regulations* (CFR) Section 1506.5(c), which have been adopted by the U.S. Air Force (32 CFR 989), require contractors and subcontractors who will prepare an environmental impact statement to execute a disclosure specifying that they have no financial or other interest in the outcome of the project.

"Financial or other interest in the outcome of the project" is defined as any direct financial benefit such as a promise of future construction or design work in the project, as well as indirect financial benefits the contractor is aware of.

In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows, to the best of their actual knowledge as of the date set forth below:

(a) _X_ Offeror and any proposed subcontractors have no financial or other interest in the outcome of the project.

(b) ___ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract, or agree to the attached plan to mitigate, neutralize or avoid any such conflict of interest.

Financial or Other Interests:

None – to the best of our knowledge and belief

Certified by:

Patricia Garcia
Signature

PATRICIA L. GARCIA
Name

SR. CONTRACTS REPRESENTATIVE
Title

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC)
Company

May 14, 2012
Date

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List of Repositories

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BOISE AGS REPOSITORIES

Boise Public Library
Library at Hillcrest
5246 West Overland Road
Boise, ID 83702

Eastern Owyhee County Library
520 Boise Avenue
Grand View, ID 83624

Lizard Butte Library
111 South 3rd Avenue West
Marsing, ID 83639

Meridian Library
Main Branch
1326 West Cherry Lane
Meridian, ID 83642

Mountain Home Public Library
790 North 10th East
Mountain Home, ID 83647

HOLLOMAN AFB REPOSITORIES

Alamogordo Public Library
920 Oregon Avenue
Alamogordo, NM 88310

Clardy Fox Branch Library
5515 Robert Alva Avenue
El Paso, TX 79905

Fort Sumner Public Library
235 West Sumner Avenue
Fort Sumner, NM 88119

Michael Nivison Public Library
90 Swallow Place
Cloudcroft, NM 88317-0515

Roswell Public Library
301 North Pennsylvania Avenue
Roswell, NM 88201

Ruidoso Public Library
107 Kansas City Road
Ruidoso, NM 88345

LUKE AFB REPOSITORIES

El Mirage Branch Library
14011 North 1st Avenue
El Mirage, AZ 85335

Gila Bend Branch Library
202 North Euclid Avenue
Gila Bend, AZ 85337

Glendale Public Library
Main Branch
5959 West Brown Street
Glendale, AZ 85302

Litchfield Park Branch
101 West Wigwam Boulevard
Litchfield Park, AZ 85340

Sun City Branch Library
16828 North 99th Avenue
Sun City, AZ 85351

Northwest Regional Library-Surprise
16089 North Bullard Avenue
Surprise, AZ 85374

Wickenburg Public Library
164 East Apache Street
Wickenburg, AZ 85390

TUCSON AGS REPOSITORIES

Copper Queen Library
6 Main Street
Bisbee, AZ 85603

Safford City-Graham County Library
808 South 7th Avenue
Safford, AZ 85546

San Carlos Public Library
San Carlos Avenue
San Carlos, AZ 85550

Sierra Vista Public Library
2600 East Tacoma Street
Sierra Vista, AZ 85635

Valencia Branch Library
202 West Valencia Road
Tucson, AZ 85706

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Glossary

Glossary

Above Ground Level (AGL): Altitude expressed in feet measured above the ground surface.

Aerial Refueling Tracks: Refueling operations are performed in designated aerial refueling tracks, anchors, or FAA approved airspace.

Air Force Instruction (AFI): Air Force Instructions implementing United States laws and regulations, and providing policy for Air Force personnel and activities.

Air Combat Command (ACC): The Air Force Command that operates combat aircraft assigned to bases within the contiguous 48 states, except those assigned to Air National Guard and the Air Force Reserve Command.

Air-to-Air Training: Air-to-air training prepares aircrews to achieve and maintain air superiority over the battlefield and defeat enemy aircraft. Air-to-air training often includes some aircraft playing the role of adversaries, or enemy forces. Air-to-air training activities include advanced handling characteristics, air combat training, low-altitude air-to-air training, and air intercept training. This training also requires the use of defensive countermeasures.

Air-to-Ground Training: Air-to-ground training employs all the techniques and maneuvers associated with weapons use and includes low-and high-altitude tactics, navigation, formation flying, target acquisition, and defensive reaction. Training activities include surface attack tactics, different modes of weapons delivery, electronic combat training, and the use of defensive countermeasures.

Air Traffic: Aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas.

Air Traffic Control (ATC): A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic.

Air Traffic Control Assigned Airspace (ATCAA): Procedural airspace established by letter of agreement between the user and ATC, within positive control (Class A) airspace, of defined vertical and lateral limits, for the purpose of providing air traffic segregation between the specified activities conducted within the assigned airspace and other IFR traffic. ATCAAs are not charted.

Clean Air Act (CAA): This Act empowered the United States Environmental Protection Agency to establish standards for common pollutants that represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety to protect public health and safety.

Candidate Species: A species for which the United States Fish and Wildlife Service has sufficient information regarding the biological vulnerability of and threat(s) to that species to warrant a proposal to reclassify it as threatened or endangered (Formerly Category 1 Candidate species).

C-Weighted Day-Night Sound Level (CDNL): C-Weighted Day-Night Sound Level is day-night sound levels computed for areas subjected to sonic booms. These areas are also subjected to subsonic noise assessed according to the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (DNL_{mr}).

Chaff: Chaff is the term for small fibers of aluminum-coated mica packed into approximately 150 gram bundles and ejected by aircraft as a self-defense measure to reflect hostile radar signals.

Council on Environmental Quality (CEQ): The Council is within the Executive Office of the President and is composed of three members appointed by the President, subject to approval by the Senate. Members are to be conscious of and responsive to the scientific, economic, social, esthetic, and cultural needs of the nation; and to formulate and recommend national policies to promote the improvement of quality of the environment.

Day-Night Average Sound Level (DNL): Day-Night Average Sound Level is a noise metric combining the levels and durations of noise events and the number of events over an extended time period. It is a cumulative average computed over a 24-hour period to represent total noise exposure. DNL also accounts for more intrusive nighttime noise, adding a 10 dB penalty for sounds after 10:00 P.M. and before 7:00 A.M. DNL is the FAA's primary noise metric. FAA Order 1050.1E defines DNL as the yearly day/night average sound level.

Decibel (dB): A sound measurement unit.

Defensive Countermeasures: Coordination of maneuvers and use of aircraft defensive systems designed to negate enemy threats. Those maneuvers (which include climbing, descending, and turning) requiring sufficient airspace to avoid being targeted by threat systems. Aircraft use sophisticated electronic equipment to jam air and ground radar-tracking systems and dispense chaff and flares to confuse hostile radar and infrared sensors.

Endangered Species: The Endangered Species Act of 1973 defined the term "endangered species" to mean any species (including any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife which interbreeds when mature) that is in danger of extinction throughout all or a significant portion of its range.

Environmental Justice: Pursuant to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, review must be made as to whether a federal program, policy, or action presents a disproportionately high and adverse human health or environmental effect on minority and/or low-income populations.

Environmental Night: The period between 10 p.m. and 7 a.m. when 10 dB is added to aircraft noise levels due to increased sensitivity to noise at night.

Fiscal Year: U.S. Government accounting year beginning 1 October through 30 September.

Flight Level: The Flight Level refers to the altitude above MSL. FL230, for example, is approximately 23,000 feet MSL.

Instrument Flight Rules (IFR): A standard set of rules that all pilots, civilian and military, must follow when operating under flight conditions that are more stringent than visual flight rules. These conditions include operating an aircraft in clouds, operating above certain altitudes prescribed by Federal Aviation Administration regulations, and operating in some locations like major civilian airports. Air traffic control agencies ensure separation of all aircraft operating under IFR.

Instrument Route (IR): Routes used by the Department of Defense and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training in both IFR and VFR weather conditions below 10,000 feet MSL at airspeeds in excess of 250 knots indicated airspeed.

Jet Route: A route designed to serve aircraft operations from 18,000 feet mean sea level (MSL) up to and including flight level 450. The routes are referred to as "J" routes with numbering to identify the designated route; e.g., J-151.

Maximum Sound Level (L_{max}): L_{max} is the highest sound level that occurs during a single aircraft overflight. For an observer, the noise level starts at the ambient noise level, rises up to the maximum level as the aircraft flies closest to the observer, and returns to the ambient level as the aircraft recedes into the distance. FAA Order 1050.1E defines L_{max} as a single event metric that is the highest A-weighted sound level measured during an event.

Mean Sea Level (MSL): Altitude expressed in feet measured above average sea level.

Military Operations Area (MOA): Airspace below 18,000 feet MSL established to separate military activities from instrument flight rule traffic and to identify where these activities are conducted for the benefit of pilots using visual flight rules.

Military Training Airspace: Special Use Airspace and Airspace for Special Use used by military aircrews to practice flight activities necessary to maintain combat readiness.

Military Training Route (MTR): A Military Training Route is a corridor of airspace with defined vertical and lateral dimensions established for conducting military flight training at airspeeds in excess of 250 nautical miles per hour.

Mitigation: CEQ Sec. 1508.20 defines “Mitigation” to include:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Nautical Mile (NM): Equal to 1.15 statute miles.

National Environmental Policy Act (NEPA): The National Environmental Policy Act of 1969 directs federal agencies to take environmental factors into consideration in their decisions.

National Historic Landmark (NHL): NHLs are places that "possess exceptional value or quality in illustrating and interpreting the heritage of the United States" and include battlefields, architectural or engineering masterpieces, ruins, and historic towns and communities.

National Historic Preservation Act (NHPA): The NHPA of 1966, as amended, established a program for the preservation of historic properties throughout the United States.

Notice to Airmen (NOTAM): A notice containing information (not known sufficiently in advance to publicize by other means) concerning the establishment, condition, or change in any component (facility, service, or procedure of, or hazard in the National Airspace System) the timely knowledge of which is essential to personnel concerned with flight operations.

Onset Rate-Adjusted Monthly Day-Night Average Sound Level (DNL_{mr}): Onset Rate-Adjusted Monthly Day-Night Average Sound Level is the measure used for subsonic aircraft noise in military airspace (MOAs or Warnings Areas). This metric accounts for the fact that when military aircraft fly low and fast, the sound can rise from ambient to its maximum very quickly. Known as an onset-rate, this effect can make noise seem louder due to the added "surprise" effect. Penalties of up to 11 dB are added to account for this onset-rate. Noise levels are interpreted the same way for L_{dnmr} as they are for DNL. (See DNL above).

Ordnance: Any item carried by an aircraft for dropping or firing, including but not limited to, live or inert bombs, ammunition, air-to-air missiles, chaff, and flares.

Restricted Areas: A restricted area is designated airspace that supports ground or flight activities that could be hazardous to non-participating aircraft.

See-and-avoid: When weather conditions permit, pilots operating IFR or VFR are required to observe and maneuver to avoid other aircraft. Right-of-way rules are contained in FAR Part 91.

Sonic Boom: A sonic boom is the impulsive noise created when a vehicle flies at speeds faster than sound.

Sortie: A sortie is a single flight, by one aircraft, from takeoff to landing.

Sortie-Operation: The use of one airspace unit (e.g., Military Operations Area or Air Traffic Control Assigned Airspace) by one aircraft. The number of sortie-operations is used to quantify the number of uses by aircraft and to accurately measure potential impacts; e.g. noise, air quality, and safety impacts. A sortie-operation is not a measure of how long an aircraft uses an airspace unit, nor does it indicate the number of aircraft in an airspace unit during a given period; it is a measurement for the number of times a single aircraft uses a particular airspace unit.

Sound Exposure Level (SEL): Sound Exposure Level (SEL) accounts for both the maximum sound level and the length of time a sound lasts. It provides a measure of the total sound exposure for an entire event. FAA Order 1050.1E defines SEL as a single event metric that takes into account both the noise level and duration of the event and referenced to a standard duration of one second.

Special Activity Airspace (SAA): Any airspace with defined dimensions within the National Airspace System wherein limitations may be imposed upon aircraft operations. This airspace may be restricted areas, prohibited areas, military operations areas, air traffic control assigned airspace, and any other designated airspace areas.

State Historic Preservation Office (SHPO): State department responsible for assigning protected status for cultural and historic resources.

Statistical Exceedance Level: The sound level exceeded x percent of the time. L_{10} is the level exceeded 10 percent of the time, L_{90} is the level exceeded 90 percent of the time, etc.

Temporary Flight Restrictions (TFR): A TFR is a geographically-limited, short-term, airspace restriction. Temporary flight restrictions often encompass major sporting events, natural disaster areas, air shows, space launches, and Presidential movements.

Threatened Species: A species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Traditional/Cultural Resource: Cultural and traditional resources are any prehistoric or historic district, site or building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes.

Victor Airway: A Victor Airway is a special kind of Class E airspace. The routes connect radio navigation beacons called very high frequency omni-directional range (VOR) stations that radiate a signal in all directions. These stations are usually located at or near airfields. North-south Victor Airways have odd numbers while east-west airways have even numbers. These federal or Victor Airways are used by both Instrument Flight Rules and Visual Flight Rules aircraft. The airspace extends from 1,200 feet AGL to 18,000 feet MSL. The width of the Victor corridor depends on the distance from the navigational aids (such as VOR's). When VOR's are less than 102 NM from each other, the Victor airway extends 4 NM on either side of the centerline (8 NM total width). When VOR's are more than 102 NM from each other, the width of the airway in the middle increases. The width of the airway beyond 51 NM from a navaid is 4.5 degrees on either side of the center line between the two navaids (at 51 NM from a navaid, 4.5 degrees from the centerline of a radial is equivalent to 4 NM). The maximum width of the airway is at the middle point between the two navaids. This is when 4.5 degrees from the center radial results in a maximum distance for both navaids.

Visual Flight Rules (VFR): A standard set of rules that all pilots, both civilian and military, must follow when not operating under instrument flight rules. These rules require that pilots remain clear of clouds and avoid other aircraft. See instrument flight rules.

Visual Routes (VR): Routes used by military aircraft for conducting low-altitude, high-speed navigation, and tactical training. These routes are flown under Visual Flight Rules.

VHF Omnidirectional Radio Range (VOR): A type of radio navigation system for aircraft. These are ground-based radio navigational aids scattered around the country A VOR station transmits a signal that the receiver can use to calculate its position relative to or from the station (see Victor Airway).

Wetland, Jurisdictional: A jurisdictional wetland is a wetland that meets all three United States Army Corps of Engineers' criterion for jurisdictional status: appropriate hydrologic regime, hydric soils, and facultative to obligate wetland plant communities under normal growing conditions.